

1995 AND 1996
PERFORMANCE REPORT
GENERAL CHEMISTRY AND
MICROBIOLOGY ANALYSES SECTION

MARCH 1998

**Ministry
of the
Environment**

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at copyright@ontario.ca

1995 and 1996

PERFORMANCE REPORT

GENERAL CHEMISTRY AND MICROBIOLOGY SECTION

Susan Janhurst (ed.)
Laboratory Services Branch
Ontario Ministry of the Environment

March 1998

ACKNOWLEDGEMENTS

The editor would like to thank the technical staff in the General Chemistry Section for their co-operation and patience in providing the Quality Control data in a timely manner and conducting reviews as requested.

TD
380
P47
1995-6
MOE

41m4

INTRODUCTION

The General Chemistry and Microbiology Section (GCMS) formerly Water Quality Analyses Section is part of the Ministry of the Environment Laboratory Services Branch. The GCMS provides expertise in inorganic chemistry and handles the largest number of tests in the branch. Technologists analyse a broad spectrum of environmental sample types including: ground water, surface water, drinking water, precipitation, raw sewage, process water, industrial waste, leachate, effluent, soil, sediment, sludge, vegetation, and air filters.

This report provides a brief outline of the analytical quality control (QC) program associated with sample analysis and, combines the 1995 and 1996 performance data for each test. GCMS strives to maintain a high standard of analytical performance through its quality assurance program and QC is an integral part of the process.

Table of Contents

1.0 Performance Report Format	1
2.0 Analytical Quality Control Program, Chemistry	4
2.1 Performance Summaries, Chemistry	7
Acidity, Gran (E3248A)	8
Acidity, Total Fixed Endpoint (E3248A)	11
Alkalinity Gran (E3042A)	14
Alkalinity Total Fixed Endpoint (E3042A)	17
Alkalinity Total Fixed Endpoint (E3218A)	20
Alkalinity Total Fixed Endpoint (E3289A)	23
Aluminum, Total (E3300A)	26
Calcium (E3146A)	29
Calcium (E3171A)	32
Calcium (E3217A)	35
Calcium (E3249A)	38
Carbon, Dissolved Inorganic (E3028A)	41
Carbon, Dissolved Inorganic (E3370A)	44
Carbon, Dissolved Organic (E3370A)	47
Carbon, Total Organic (E3247B)	50
Carbon, Total Particulate (E3141A)	53
Chloride (E3004A)	56
Chloride (E3016A)	59
Chloride (E3147A)	62
Chloride (E3148A)	65
Chloride (E3372A)	68
Chlorine, Total Residual (E3309A)	71
Chlorophyll "a" (E3169A)	74
Chlorophyll "a" Acidified (E3169A)	77
Chlorophyll "b" (E3169A)	79
Colour, True (E3025A)	81
Colour, True (E3219A)	84
Conductivity (E3024B)	87
Conductivity (E3177A)	90
Conductivity (E3218A)	93
Conductivity (E3289A)	96
Cyanide, Free (E3014A)	99
Cyanide, Total (E3015A)	102
Fluoride (E3369A)	105
Hardness (E3171A)	108
Hardness (E3217A)	109
Hardness (E3249A)	110
Iron, Total (E3303B)	111
Lithium (E3392A)	114
Magnesium (E3146A)	117

Table of Contents Continued

Magnesium (E3171A)	120
Magnesium (E3217A)	123
Magnesium (E3249A)	126
Manganese (E3303B)	129
Nitrate (E3004A)	132
Nitrogen, Ammonia Plus Ammonium (E3149A)	135
Nitrogen, Ammonia Plus Ammonium (E3364A)	136
Nitrogen, Ammonia Plus Ammonium (E3366A)	139
Nitrogen, Ammonia Plus Ammonium (E3374A)	142
Nitrogen, Nitrate (E3148A)	145
Nitrogen, Nitrate (E3372A)	149
Nitrogen, Nitrate Plus Nitrite (E3364A)	152
Nitrogen, Nitrate Plus Nitrite (E3366A)	155
Nitrogen, Nitrate Plus Nitrite (E3369A)	158
Nitrogen, Nitrate Plus Nitrite (E3374A)	161
Nitrogen, Nitrite (E3364A)	164
Nitrogen, Nitrite (E3366A)	167
Nitrogen, Total Kjeldahl (E3116A)	170
Nitrogen, Total Kjeldahl (E3118A)	173
Nitrogen, Total Kjeldahl (E3367A)	176
Nitrogen, Total Kjeldahl (E3368A)	179
Oxygen Demand, Biochemical (E3182A)	182
Oxygen Demand, Chemical (E3170A)	186
Oxygen Demand, Chemical (E3246A)	189
pH (E3042A)	192
pH (E3218A)	195
pH (E3248A)	198
pH (E3289A)	201
Phenolics, Reactive (E3179A)	204
Phosphorus, Reactive ortho-Phosphate (E3364A)	207
Phosphorus, Reactive ortho-Phosphate (E3366A)	210
Phosphorus, Total (E3116A)	213
Phosphorus, Total (E3118A)	216
Phosphorus, Total (E3367A)	219
Phosphorus, Total (E3368A)	222
Potassium (E3146A)	225
Potassium (E3171A)	228
Potassium (E3217A)	231
Potassium (E3249A)	234
Silicon, Reactive Silicates (E3370A)	237
Sodium (E3146A)	240
Sodium (E3171A)	243
Sodium (E3217A)	246

Table of Contents Continued

Sodium (E3249A)	249
Solids, Dissolved (E3188B)	252
Solids, Dissolved (E3365A)	255
Solids, Suspended (E3188B)	258
Solids, Suspended (E3365A)	261
Solids, Suspended Ignited (E3188B)	264
Solids, Total (E3188B)	268
Solids, Total (E3365A)	272
Solids, Total Ignited (E3188B)	275
Sulphate (E3004A)	279
Sulphate (E3147A)	282
Sulphate (E3148A)	285
Sulphate (E3172A)	290
Sulphate (E3372A)	293
Turbidity (E3311A)	296
 Bibliography	 299
Abbreviations	300
Appendix A	302
Appendix B	303

1.0 PERFORMANCE REPORT FORMAT

Each parameter analyzed by the General Chemistry and Microbiology Section formerly Water Quality Section has a performance summary. Due to a reduction in workload in 1996 this report includes the '95 data in the summaries where applicable.

The performance report is organized alphabetically according to test name (eg. Total Organic Carbon is filed under the heading "Carbon, Total Organic") and second, by the method reference number. Detailed information concerning each of these pages is outlined next.

1.1 TEST DESCRIPTION

<u>TITLE:</u>	The name of the test parameter.
<u>IDENTIFICATION:</u> Laboratory Unit:	Location where the test is performed.
Method Reference No:	A number assigned by the Quality Management Office to an analytical test method eg.(E3228A). E3 denotes a Central Regional Lab test method. The subsequent three numbers are issued sequentially per method. A letter at the end denotes revision status.
LIMS Product Code:	LIMS code for analysis request.
Sample Type/Matrix:	The various sample types that can be routed to the department.
Method Introduced:	Date that the method was implemented at the laboratory.
Units:	Unit of measurement in which the results are reported.
Supervisor:	Name of supervisor responsible for the designated laboratory.

SAMPLING:

The type of container and preservative (if applicable) that is used and minimum volume of sample that is usually required. Any sample preparation that is normally performed in the field, is also indicated (1).

SAMPLE PREPARATION:

Sample preparation techniques which are usually performed at the laboratory before analysis.

ANALYTICAL PROCEDURE:

Analytical method used to determine the parameter.

INSTRUMENTATION:

Type of instrumentation, used to perform the test. Automated continuous flow systems, consist of a sampler, peristaltic pump, manifold for reagent addition, detection system and readout system. Microcomputers are used to control the operation of analytical equipment and/or data acquisition.

REPORTING:

W and T are low level data qualifiers assigned to data that are near or below the detection limit values (2). The code <W indicates that no measurable response was observed under the test conditions. The value reported indicates the minimum amount of analyte measured under routine conditions. The code <T is used to represent a measurable amount of the analyte which under the test conditions is not verifiable. The reported result should be used only for large batches of similar data to evaluate background levels or trends of contaminants in the environment where more sensitive analytical methods are not available.

To provide a consistent Laboratory Services Branch approach to data reporting, the Water Quality Section calculates W from the standard deviation of duplicates (S_2), near zero, by rounding down to the nearest 1,2 or 5 digit. T is five times W. The latest calculations, valid at date of publication for W and T values of all active methods, are contained in this report (APPENDIX B).

Data is reported to a maximum of three significant figures to the nearest W.

CALIBRATION:

The number of standards used to calibrate the analytical system plus blanks if applicable.

CONTROLS:

The calibration, drift, recovery, and interference controls that are used when applicable to ensure that the system is operating properly.

MODIFICATIONS:

Modifications to the test in 1995/96.

NOTES:

Explanatory notes which may aid the data user in interpreting results and information.

1.2 PERFORMANCE DATA SUMMARY

QUALITY CONTROL DATA FROM/TO:

The period of time over which data were collected.

ANALYTICAL RANGE and REPORTING UNIT:

The full scale value for the analytical range is given in concentration units.

CALIBRATION CONTROL:

Calibration control includes a table outlining the number of data collected over a selected time period; expected concentrations of the control standards; the calculated mean concentration of these standards; mean bias (mean concentration minus the expected concentration); and standard deviations of each control standard. The between run standard deviation (S), the within run standard deviation (S_w), the ratio S/S_w , and the control limits for standards sums and differences are provided.

RECOVERIES (Where applicable):

The table outlines the number of data collected over a selected time period; expected concentrations of the recovery standards; the calculated mean concentration of these standards; and standard deviations of each recovery standard.

DUPLICATES:

The table outlines within run duplicate data. The data is sorted into a number of concentration spans. The standard deviation for duplicates is provided for each range. The coefficient of variation (%) is determined by dividing the mean standard deviation (S_2) for a particular concentration span by the mean concentration of duplicate results in that span and multiplying by 100.

OTHER CHECKS (Where applicable):

The table outlines the number of data collected over a selected time period; the calculated mean concentration of ie. blank; and standard deviation.

1.3 QUALITY CONTROL GRAPHICS

CALIBRATION CONTROL:

Calibration control standards sums and differences are plotted on a horizontal scale for the period of data collection (referred to on the graphs as "QUALITY CONTROL STANDARD A+B" for example). The vertical scale consists of the control limits expressed on either side of the expected value. Control limits were chosen from previous analytical performance data.

2.0 Analytical Quality Control Program

Quality control is a continuous process that involves constant checks of sample processing. This report summarizes the QC data collected during analytical processing to monitor performance of the analytical system.

Calibration is conducted by analyzing a series of calibration standards covering the analytical range. Since a high degree of both precision and accuracy is required to detect and minimize any between-run changes, the standards are analyzed with as little handling as possible.

Once a system has been calibrated, quality control begins. Depending on the analytical procedure, quality control may be used to evaluate: calibration, blank, recovery, sensitivity, potential interference, and sample repeatability.

Calibration and Blank

Calibration is controlled by a minimum of two quality control standards and a long term blank which are prepared and maintained independently of the calibration standards. The system is not calibrated with the quality control standards. The long term blank is prepared identical to the quality control standards but with zero concentration of the analyte. Control standards are prepared less frequently than calibration standards and errors in newly prepared calibration standards can be detected by this cross check. Newly prepared control standards are run in parallel with the old control standards and must meet control requirements over three consecutive runs before the new standards are accepted on line.

The standard deviation of the control standards is used to estimate the between run standard deviation (S) and is compared against the within run standard deviation (S_w). If the ratio S/S_w exceeds 1.5 then poor control of systematic error can be inferred (3). Values for S and S_w are calculated as follows:

$$2S^2 = (S_A)^2 + (S_B)^2$$

$$2S_w^2 = (S_{A-B})^2$$

Where

S_A = standard deviation of control standard A

S_B = standard deviation of control standard B

S_{A-B} = standard deviation of the difference between control standards A and B

NOTE: If a second range is employed for a test, more control standards are used because, in many systems, the between run standard deviations are concentration dependent.

Detailed description of the quality control processes are outlined in several LSB reports (2)(4)(5) and (6).

Control Limits

The control standards data are assessed and compared against the control limits established from previous data to determine whether the calibration process is in control. The control limits are examined yearly and may be adjusted if the method performance improves and/or the historical data base is increased. Control limits are calculated for the sums and differences of control standards (A,B,C,D) by the equations:

$$(A+B) \pm 4.0 \times S_{A-B} \text{ for the sum of A+B}$$

$$(B+C) \pm 4.0 \times S_{B-C} \text{ for the sum of B+C}$$

$$(C+D) \pm 4.0 \times S_{C-D} \text{ for the sum of C+D}$$

$$(A-B) \pm 3.0 \times S_{A-B} \text{ for the difference of A-B}$$

$$(B-C) \pm 3.0 \times S_{B-C} \text{ for the difference of B-C}$$

$$(C-D) \pm 3.0 \times S_{C-D} \text{ for the difference of C-D}$$

Note: Warning Limits are calculated by the same formulae above (using 2.0 instead of 4.0 and 3.0 respectively).

If a control limit is exceeded, the analysis is stopped, corrective action taken and the control standards are re-analyzed.

Recovery

Some methods require sample pre-treatment, such as digestion or extraction. A recovery check, suitable to that method, is required to estimate the efficiency of the pre-treatment. Recovery standards are usually prepared at 0%, 20% and 80% of full scale. The solutions are analyzed in the same manner as routine samples. Although these solutions are not used to calibrate the instrument, corrections for the blank and matrix effects are calculated and applied if necessary. For an analytical run to be accepted, the recoveries should be within $\pm(5\% + T/2)$ of their expected values. (T is defined in Appendix A). The average blank should be within three standard deviations of its historical mean. If a second range is employed for a test, at least one additional recovery standard is used.

Sensitivity and Baseline

Any change in the sensitivity of the instrumentation is monitored periodically by analyzing a standard that is usually 80% of full scale, and comparing the peak height to the original calibration standards. Baseline drift is usually recorded by periodic analysis of pure deionized water (Pure-DW) which does not contain any of the analyte, but may be adjusted to correspond to sample pre-treatment.

Interference

Interference checks are run on any test where a substance may be present in large enough

concentration to affect the results. The checks are near the threshold concentration, beyond which the methodological safeguards used to minimize the interferences are no longer effective. These checks indicate that the interferences have no effect up to the specified concentrations. Spiked samples are not analyzed on a routine basis.

Sample Repeatability

Generally, one sample out of twenty is run in duplicate up to a maximum of three per day. The samples are selected for non-adjacent, within-run duplicate analyses. By analyzing samples in duplicate, the ability of the analyst to obtain repeatable analytical results, within an analytical run, can be determined. For results to be acceptable, at least two-thirds of the duplicate data must conform to limits which are based on historical performance.

The observed differences in duplicate results are accumulated and sorted according to sample concentration span. A standard deviation is calculated for each sample concentration span. The algorithm differs from the conventional standard deviation as follows:

Conventional Std. Dev. (1)*

Std. Dev. of Duplicates (2)*

$$S_1 = \sqrt{\frac{\sum_{i=1}^n (\bar{x} - x_i)^2}{n-1}}$$

$$S_2 = \sqrt{\frac{\sum_{i=1}^{n'} (x_{1i} - x_{2i})^2}{2n'}}$$

* Standard deviations used for the data summaries.

Where
 S_1 = sample standard deviation
 S_2 = duplicate difference standard deviation
 n = number of data
 $\bar{x}$ = mean of data
 x_i = i^{th} result
 $(x_1 - x_2)_i$ = difference of the i^{th} duplicate
 n' = number of duplicate pairs

Reported values for duplicate standard deviations have been treated by robust statistical methods (7)(8). The standard deviation (S_2) of the duplicate difference is also expressed as the coefficient of variation (CV) using the untreated standard deviation.

$$CV = \frac{S_2}{\bar{X}} \times 100$$

2.1 PERFORMANCE SUMMARIES

ACIDITY, GRAN

IDENTIFICATION:

Laboratory Unit	MISA	Method Introduced	01/08/82
Method Reference No	E3248A	Units	$\mu\text{g/L as H}^+$
LIMS Product Code	PHACD3248	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Sample aliquots (50.0 mL) are titrated with 0.01 N sodium hydroxide to pH >8.3. The titrant is standardized against 0.0005 N potassium hydrogen phthalate. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH readings following each aliquot of titrant. Data are subjected to Gran analysis. pH and total fixed endpoint acidity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
--------------------------------	--------------------	--------------------

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	LTBL (expected result is 16.6 $\mu\text{g/L as H}^+$) plus 2 standards, e.g. QCA
-------------	---

NOTES:

A new automated system was introduced in Sept' 96.

ACIDITY, GRAN

QUALITY CONTROL DATA FROM 13/09/96 TO 20/12/96

Laboratory Unit: Titration

Analytical Range: to 1000 µg/L as H⁺

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	14	500.0	506.1	6.1	10.051
B:	14	200.0	201.3	1.3	4.4071
A+B:	14	700.0	707.4	7.4	12.887
A-B:	14	300.0	304.8	4.8	8.649

s.d.(AB) S(between runs): 7.76 Sw(within run): 6.12 S/Sw: 1.3

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

668 - 732 for A+B
276 - 324 for A-B

DUPLICATES:

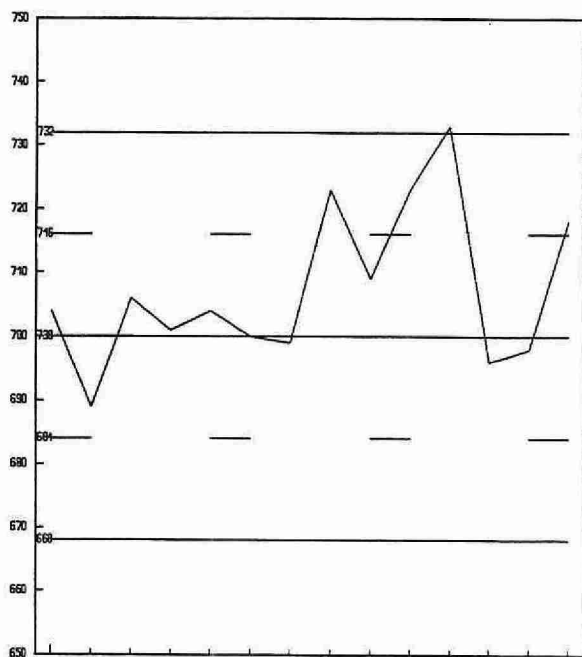
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
24	0 - 200	2.9972	7.8
0	201 - 500	N.A.	N.A.
0	501 - 1000	N.A.	N.A.
24	Overall	2.9972	

OTHER CHECKS:

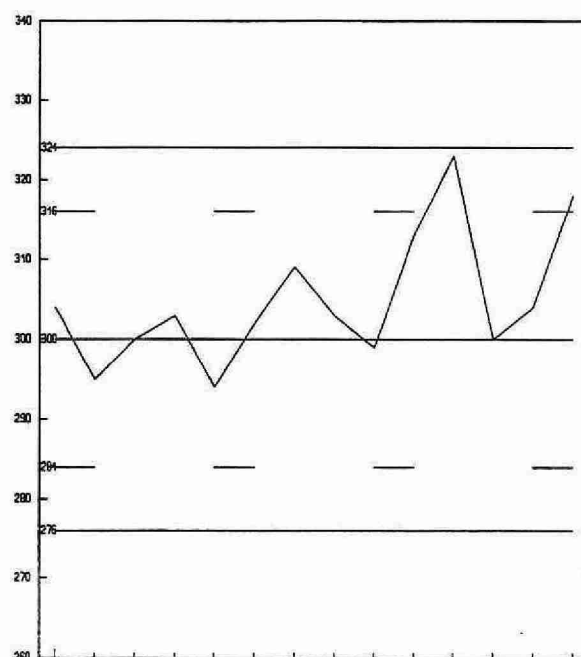
	n	Mean	Standard Deviation (1)
Long Term Blank	13	1.8	4.3091

ACIDITY, GRAN ($\mu\text{g/L as H}^+$)

QUALITY CONTROL DATA FROM 13/09/96 TO 20/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

_____ Control Limit
 - - - - - Warning Limit

ACIDITY, TOTAL FIXED ENDPOINT

IDENTIFICATION:

Laboratory Unit	MISA	Method Introduced	01/08/82
Method Reference No.	E3248A	Units	mg/L as CaCO ₃
LIMS Product Code	PHACD3248	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow, Domestic Waters, Rivers, Lakes (by special request: Industrial Waste, Sewage)		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Sample aliquots (50.0 mL) are titrated with 0.01 N sodium hydroxide to pH >8.3. The titrant is standardized against 0.0005 N potassium hydrogen phthalate. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH readings following each aliquot of titrant. pH and gran acidity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
-------------	---------------------------------

NOTES:

A new automated system was introduced in Sept' 96.

ACIDITY, TOTAL FIXED ENDPOINT

QUALITY CONTROL DATA FROM 13/09/96 TO 20/12/96

Laboratory Unit: Titration

Analytical Range: to 100 mg/L as CaCO₃

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	14	25.0	25.39	0.39	0.55409
B:	14	10.0	10.12	0.12	0.2004
A+B:	14	35.0	35.51	0.51	0.6825
A-B:	14	15.0	15.27	0.27	0.4470

s.d.(AB)

S(between runs):

0.41

Sw(within run):

0.32

S/Sw: 1.3

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

34.2 - 35.8 for A+B
13.4 - 16.6 for A-B

DUPLICATES:

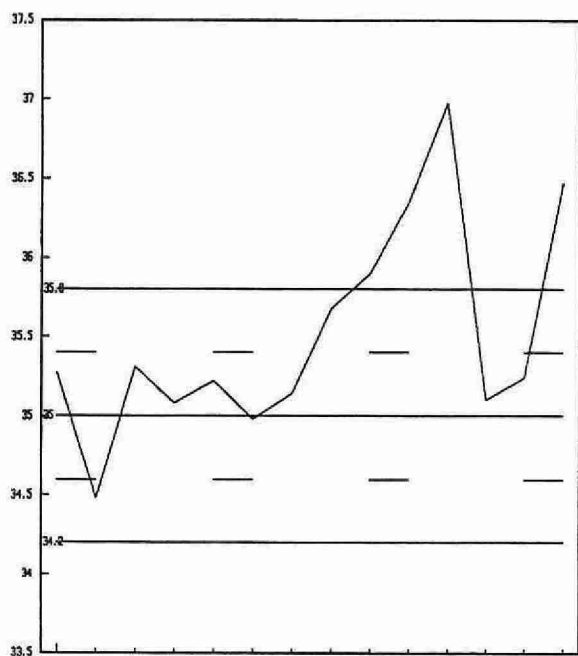
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
24	0.0 - 20.0	0.1205	4.4
0	20.1 - 50.0	N.A.	N.A.
0	50.1 - 100.0	N.A.	N.A.
24	Overall	0.1205	

OTHER CHECKS:

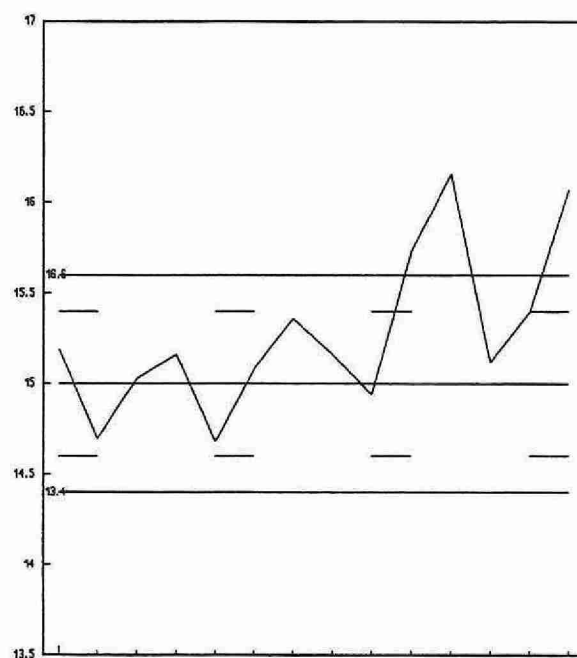
	n	Mean	Standard Deviation (1)
Long Term Blank	14	0.16	0.2668

ACIDITY, TOTAL FIXED ENDPOINT (mg/L as CaCO3)

QUALITY CONTROL DATA FROM 13/09/96 TO 20/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
 ----- Warning Limit

ALKALINITY, GRAN

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	26/07/79
Method Reference No.	E3042A	Units	mg/L as CaCO ₃
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, Groundwaters		

SAMPLING:

Quantity Required:	150 mL
Container:	250 mL Amber polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

ANALYTICAL PROCEDURE:

Samples (100 mL) are weighed (volume = weight), and titrated with 0.02 N sulphuric acid to a pH <3.7. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant. Data are subjected to Gran analysis.

N.B. pH is determined simultaneously.

INSTRUMENTATION:

Semi-automated modular titration system with microcomputer control and data reduction software.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

CONTROLS:

Calibration	LTBL plus 4 standards, e.g. QCA
Drift	2 standard buffers - 2 times daily

ALKALINITY, GRAN

QUALITY CONTROL DATA FROM 02/01/95 TO 19/12/96

Laboratory Unit: Dorset

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	206	20.0	19.908	-0.092	0.3052
B:	206	5.0	4.947	-0.053	0.2023
C:	206	-5.0	-4.918	0.082	0.1966
D:	206	-1.25	-1.232	0.018	0.1926
A+B:	206	25.0	24.855	-0.145	0.4082
A-B:	206	15.0	14.961	-0.039	0.3183
C+D:	206	-6.25	-6.150	0.100	0.3404
C-D:	206	-3.75	-3.687	0.063	0.1888

s.d.(AB) S(between runs): 0.26 Sw(within run): 0.22 S/Sw: 1.1
s.d.(CD) S(between runs): 0.19 Sw(within run): 0.13 S/Sw: 1.5

The calibration is accepted if the calibration control values obtained lie within the ranges:

24.0 - 26.0 for A+B
14.0 - 16.0 for A-B
-8.89 - -3.61 for C+D
-5.73 - -1.77 for C-D

DUPLICATES:

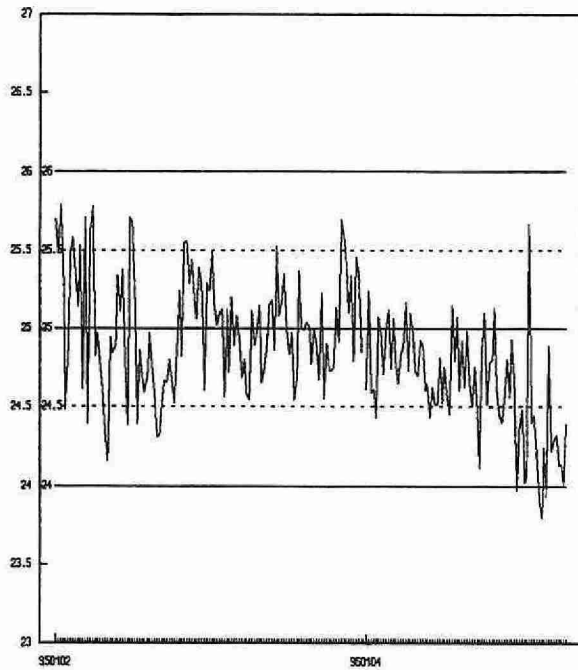
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
274	-5.0 - 30.0	0.1051	8.3
3	30.1 - 60.0	0.4035	0.8
27	60.1 - 150.0	1.5725	1.6
65	151 - 300	2.5732	1.3
369	Overall	0.1898	

OTHER CHECKS:

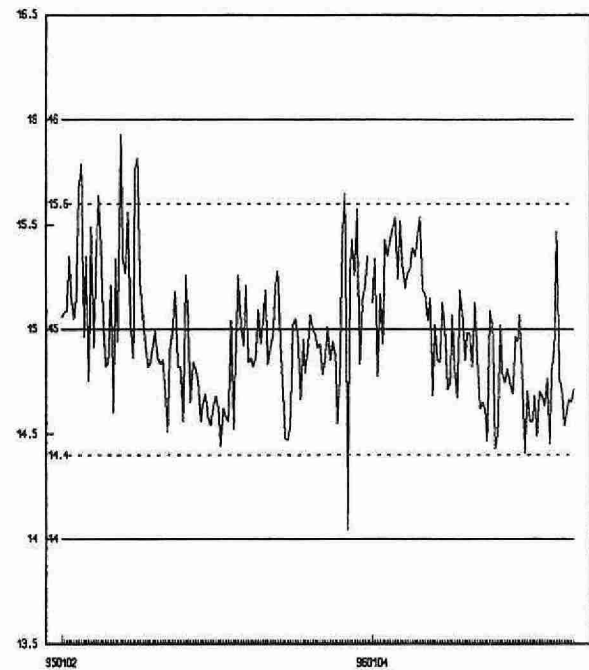
	n	Mean	Standard Deviation (1)
Long Term Blank	206	-0.0665	0.1613

ALKALINITY, GRAN (mg/L as CaCO₃)

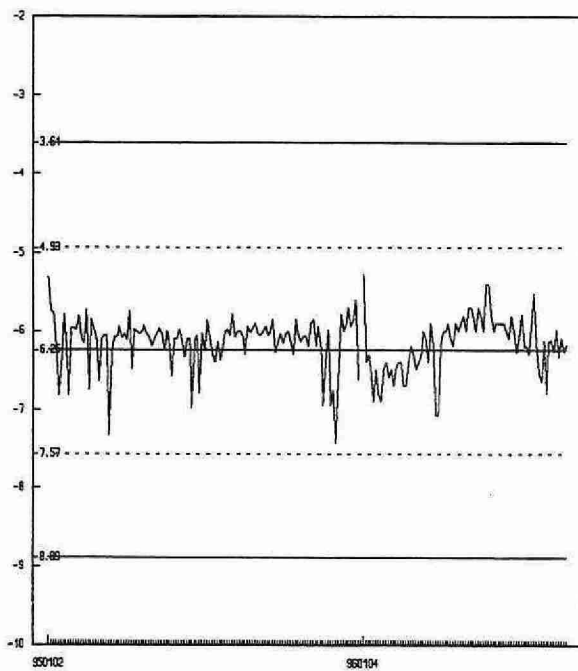
QUALITY CONTROL DATA FROM 02/01/95 TO 19/12/96



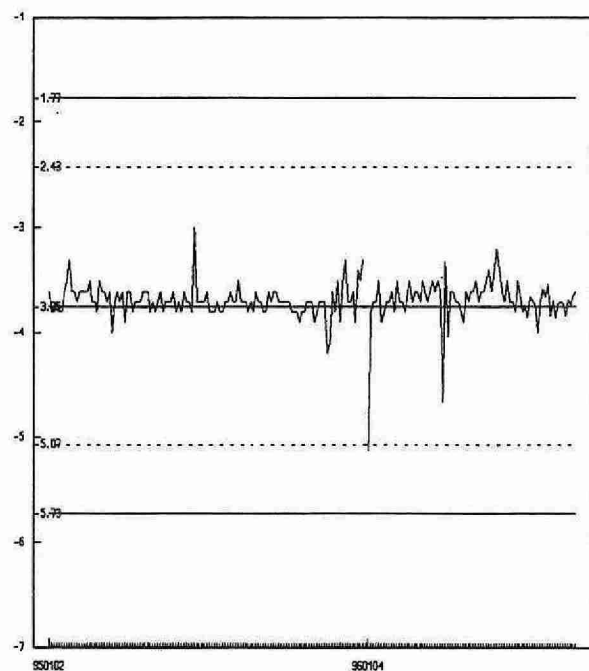
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

———— Control Limit
 ----- Warning Limit

ALKALINITY, TOTAL FIXED ENDPOINT

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	26/07/79
Method Reference No.	E3042A	Units	mg/L as CaCO ₃
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, Groundwaters		

SAMPLING:

Quantity Required:	150 mL
Container:	250 mL Amber polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

ANALYTICAL PROCEDURE:

Samples (100 mL) are weighed (volume = weight), and titrated with 0.02 N sulphuric acid to a pH 4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant.

INSTRUMENTATION:

Semi-automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	2 standard buffers - once daily

ALKALINITY, TOTAL FIXED ENDPOINT

QUALITY CONTROL DATA FROM 02/01/95 TO 19/12/96

Laboratory : Dorset

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	205	20.0	19.8	-0.2	0.2954
B:	205	5.00	4.9	-0.1	0.1730
A+B:	205	25.0	24.7	-0.3	0.3539
A-B:	205	15.0	14.8	-0.2	0.3116

s.d.(AB)

S(between runs): 0.24

Sw:(within run): 0.21

S/Sw: 1.1

On any given day the calibration is accepted if the values obtained lie within the ranges:

24.0 - 26.0 for A+B
14.0 - 16.0 for A-B

DUPLICATES:

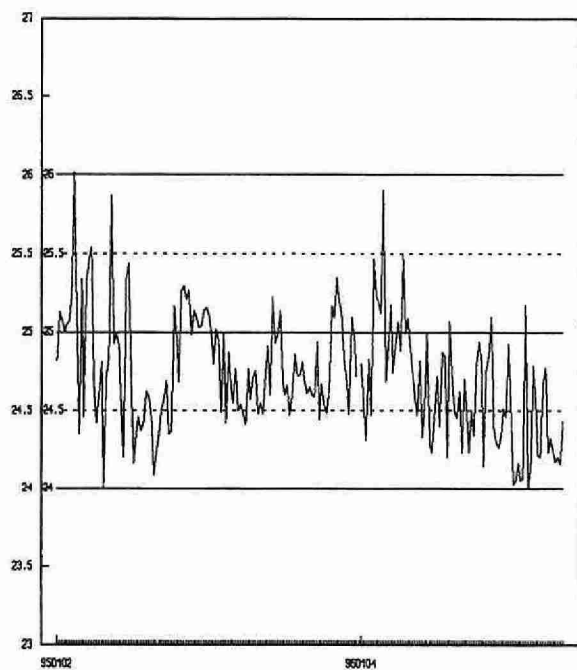
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
422	0.0 - 30.0	0.0592	3.0
3	30.1 - 60.0	0.6283	1.1
26	60.1 - 150	0.5426	0.5
86	151 - 300	1.0543	0.9
537	Overall	0.1158	

OTHER CHECKS:

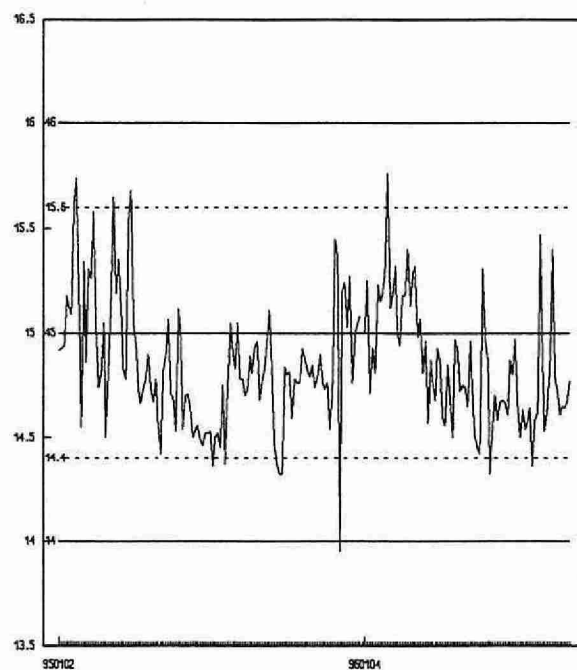
	n	Mean	Standard Deviation (1)
Long Term Blank	205	1.637	0.1139

ALKALINITY, TOTAL FIXED ENDPOINT (mg/L as CaCO₃)

QUALITY CONTROL DATA FROM 02/01/95 TO 19/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

ALKALINITY, TOTAL FIXED ENDPOINT

IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	09/07/80
Method Reference No.	E3218A	Units	mg/L as CaCO ₃
LIMS Product Code	PHALK3218	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Sewage, Effluents		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are titrated with 0.02 N sulphuric acid to pH endpoint of 4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant. pH, and conductivity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	BL plus 4 standards, e.g. QCA
Drift	In run standards throughout the run (tap water diluted to 50% V/V)

ALKALINITY, TOTAL FIXED ENDPOINT

QUALITY CONTROL DATA FROM 05/01/95 TO 24/12/96

Laboratory Unit: Titration

Analytical Range: to 1000 mg/L as CaCO₃

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	166	250	249.21	-0.79	1.9099
B:	166	100	100.33	0.33	0.5286
C:	166	100	99.19	-0.81	0.9089
D:	166	25	24.61	-0.39	0.4212
A+B:	166	350	349.54	-0.46	2.1862
A-B:	166	150	148.89	-1.11	1.7478
C+D:	166	125	123.80	-1.20	1.1175
C-D:	166	75	74.58	-0.42	0.8707

s.d.(AB) S(between runs): 1.40 Sw(within run): 1.24 S/Sw: 1.1

s.d.(CD) S(between runs): 0.71 Sw(within run): 0.62 S/Sw: 1.2

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

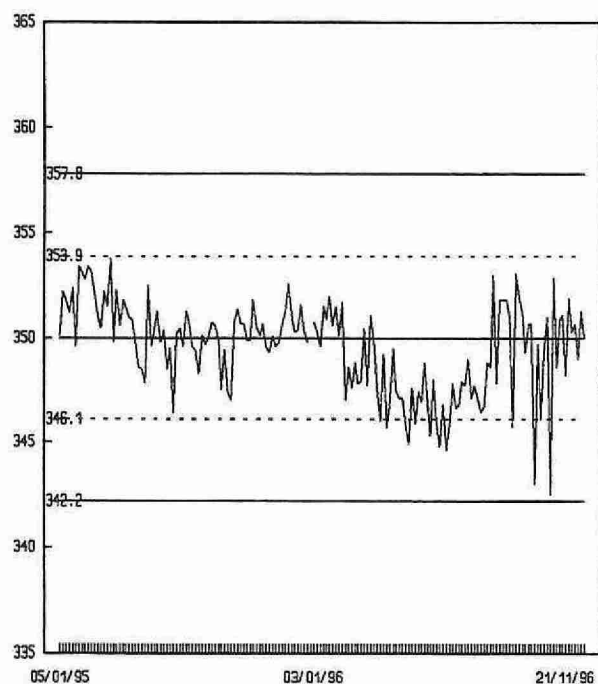
342.20	-	357.80	for	A+B
144.15	-	155.85	for	A-B
119.84	-	130.16	for	C+D
71.13	-	78.87	for	C-D

DUPLICATES:

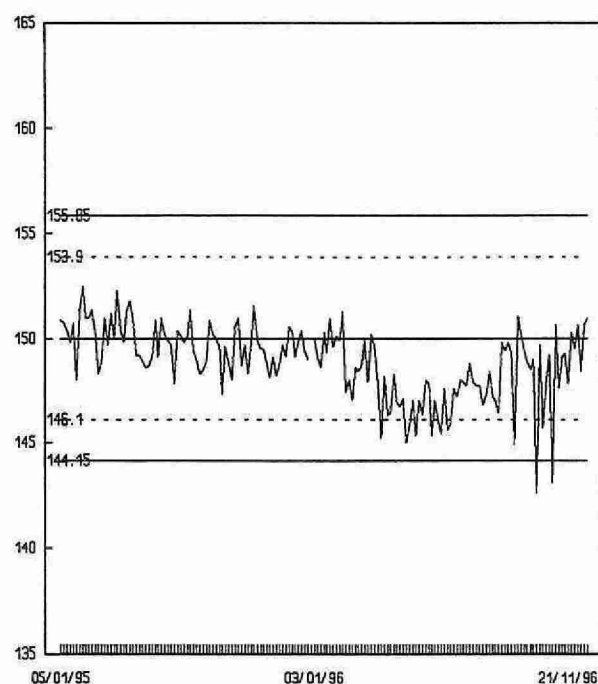
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
165	0 - 100	0.5198	1.5
92	101 - 200	0.9994	0.8
86	201 - 500	1.5134	2.2
6	501 - 1000	1.1576	2.1
349	Overall	0.8836	

ALKALINITY, TOTAL FIXED ENDPOINT (mg/L as CaCO3)

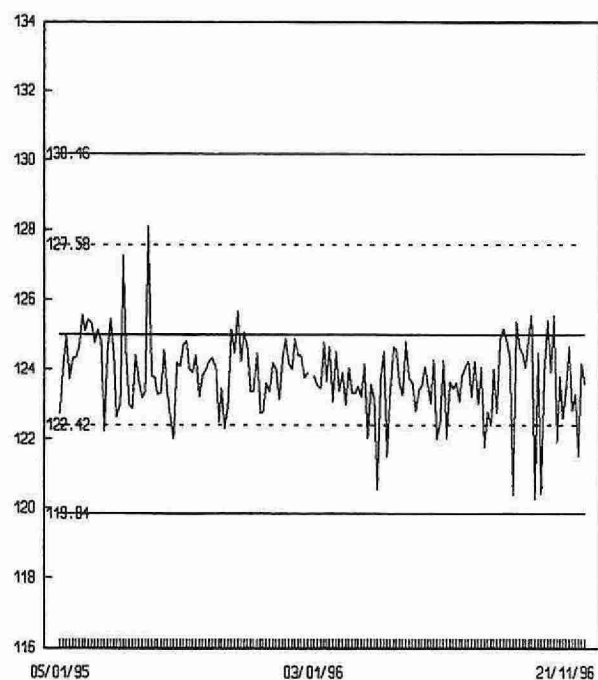
QUALITY CONTROL DATA FROM 05/01/95 TO 24/12/96



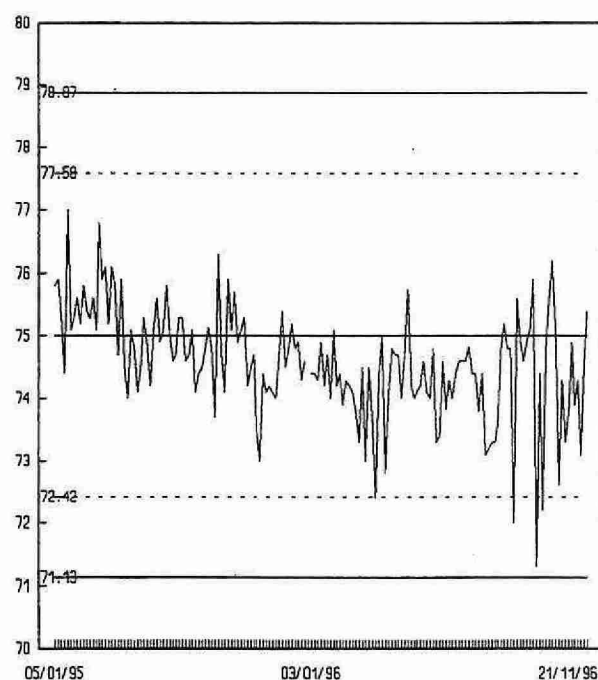
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

———— Control Limit
----- Warning Limit

ALKALINITY, TOTAL FIXED ENDPOINT

IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	09/07/80
Method Reference No.	E3289A	Units	mg/L as CaCO ₃
LIMS Product Code	PHALK3289	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are titrated with 0.02 N sulphuric acid to pH <4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant. pH and conductivity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	BL plus 4 standards, e.g. QCA
Drift	In run standards throughout the run (tap water diluted to 20% V/V)

ALKALINITY, TOTAL FIXED ENDPOINT

QUALITY CONTROL DATA FROM 03/01/95 TO 24/12/96

Laboratory Unit: Titration

Analytical Range: to 1000 mg/L as CaCO₃

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	99	250.0	250.34	0.34	1.694
B:	99	50.0	50.27	0.27	0.321
C:	99	10.0	9.76	-0.24	0.130
D:	99	2.5	2.50	0.00	0.088
A+B:	99	300.0	300.61	0.61	1.898
A-B:	99	200.0	200.07	0.07	1.532
C+D:	99	12.5	12.26	-0.24	0.179
C-D:	99	7.5	7.27	-0.23	0.131

s.d.(AB) S(between runs): 1.22 Sw(within run): 1.08 S/Sw: 1.1

s.d.(BC) S(between runs): 0.111 Sw(within run): 0.092 S/Sw: 1.2

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

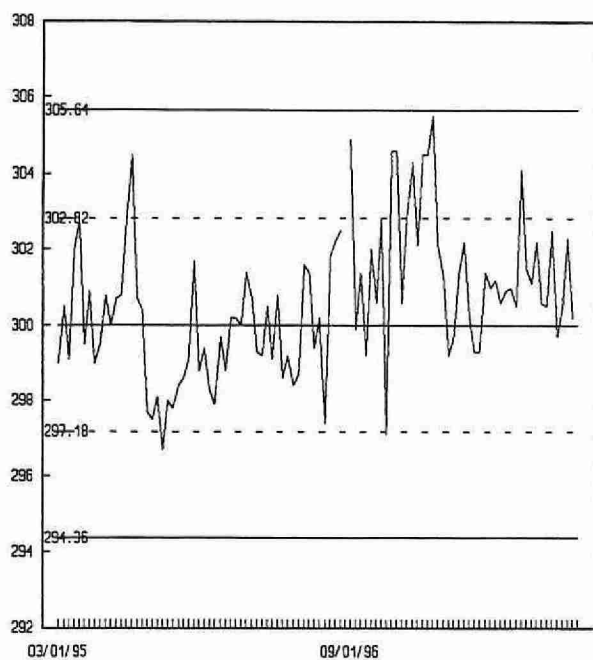
294.36	-	305.64	for	A+B
195.77	-	204.23	for	A-B
11.76	-	13.24	for	C+D
6.95	-	8.05	for	C-D

DUPLICATES:

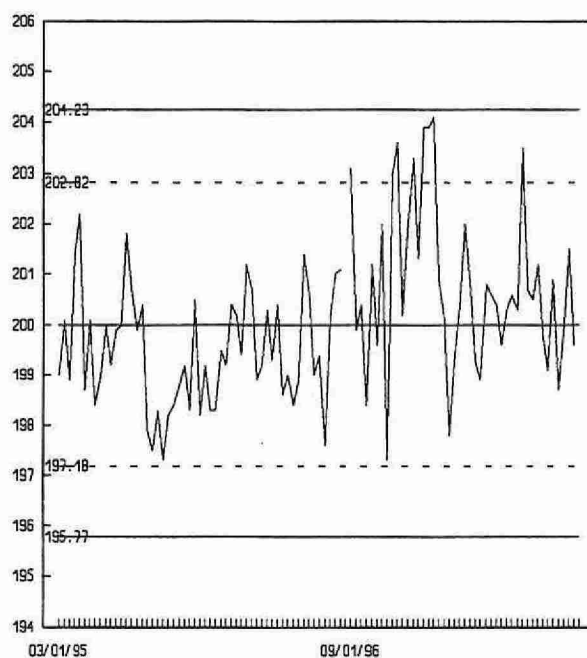
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
56	0 - 50	0.1498	2.0
41	51 - 100	0.6333	0.8
166	101 - 300	1.5993	1.9
1	301 - 1000	N.A.	N.A.
264	Overall	1.1699	

ALKALINITY, TOTAL FIXED ENDPOINT (mg/L as CaCO₃)

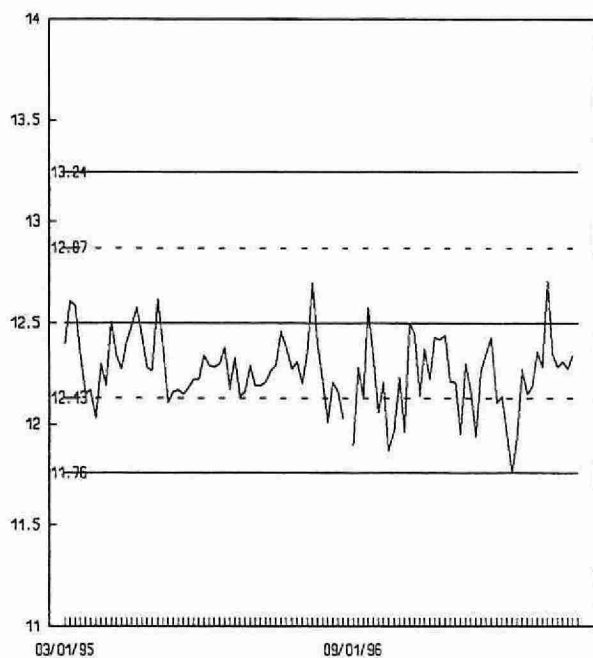
QUALITY CONTROL DATA FROM 03/01/95 TO 24/12/96



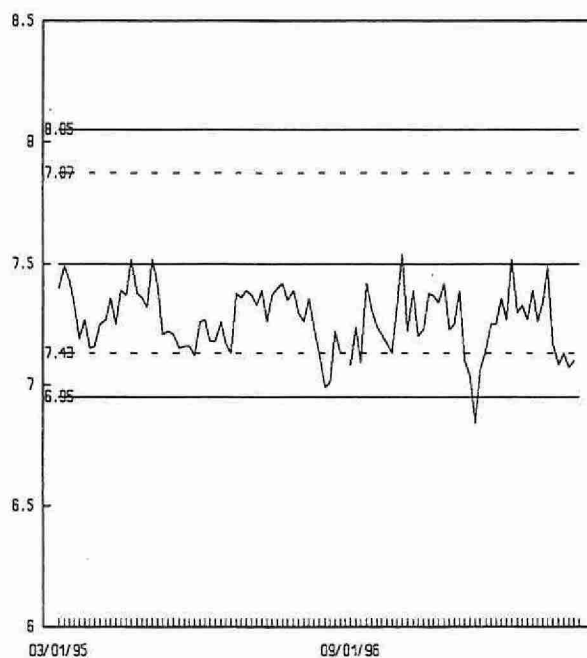
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

———— Control Limit
----- Warning Limit

ALUMINUM, TOTAL

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	06/09/83
Method Reference No.	E3300A	Units	µg/L as Al
LIMS Product Code	AL3300	Supervisor	J. McBride
Sample Type/Matrix	Streams, Lakes, Precipitation, Biota and Groundwaters		

SAMPLING:

Quantity Required	10 mL
Container	100 mL Polypropylene bottle capped, acidified to 0.1% with HNO ₃

ANALYTICAL PROCEDURE:

This procedure is based on the formation of an aluminum-catechol violet complex at pH 6.2. Acidified samples are oxidized by UV digestion for total aluminum. Phenanthroline-hydroxylamine-HCL reagents are used to reduce interference by iron. Concentrations of aluminum are determined by comparison with a similarly prepared series of standards.

INSTRUMENTATION:

UV-digester

An autoanalyzer with microprocessor for DCI system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
--------------------------------	--------------------	---------------------

CALIBRATION:

BL plus 8 standards daily

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

ALUMINUM, TOTAL

QUALITY CONTROL DATA FROM 06/01/95 TO 18/12/96

Laboratory: Dorset

Full Scale: to 1000 µg/L as Al

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	88	600	599	-1	3.1439
B:	88	200	201	1	1.8035
C:	88	60	59.7	-0.3	2.5122
A+B:	88	800	800.3	0.3	4.3659
A-B:	88	400	398	-2	2.6855
B+C:	88	260	261	1	3.8067
B-C:	88	140	141	1	2.1534

s.d.(AB)	S(between runs):	2.56	Sw(within run):	1.90	S/Sw: 1.3
s.d.(BC)	S(between runs):	2.19	Sw(within run):	1.52	S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

780	-	820	for	A+B
385	-	415	for	A-B
250	-	270	for	B+C
134	-	146	for	B-C

DUPLICATES:

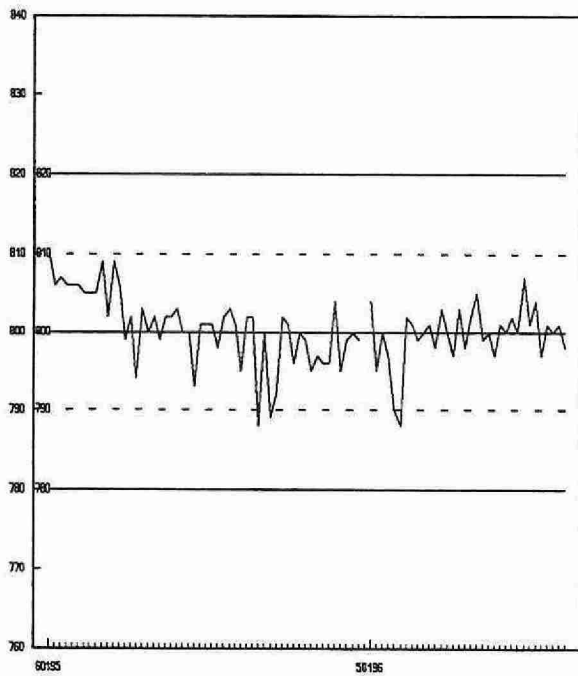
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
122	0.0 - 100	1.4971	3.9
88	101 - 200	1.9929	1.4
47	201 - 500	2.5631	0.7
5	501 - 1000	4.2722	0.5
262	Overall	1.8039	

OTHER CHECKS:

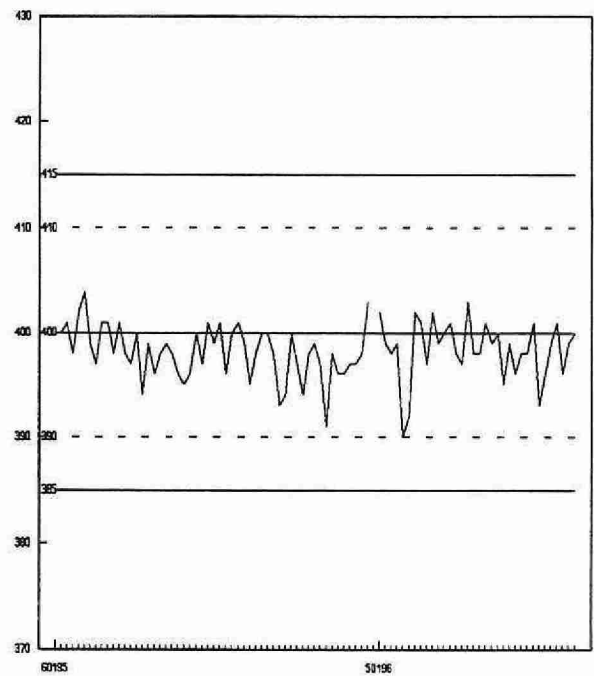
	n	Mean	Standard Deviation (1)
Long Term Blank	88	0.6705	0.9793

ALUMINUM, TOTAL ($\mu\text{g/L}$ as Al)

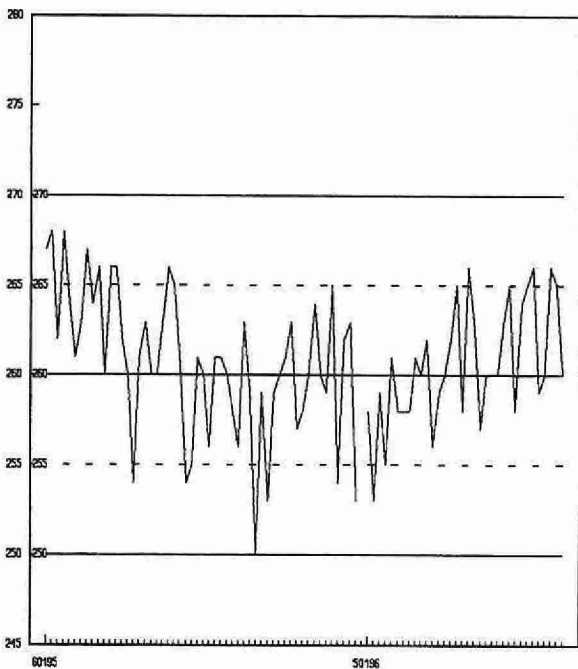
QUALITY CONTROL DATA FROM 06/01/95 TO 18/12/96



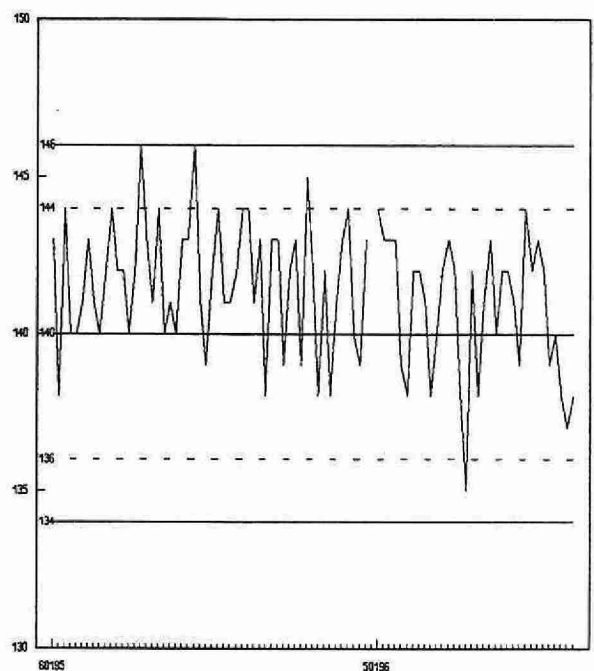
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
----- Warning Limit
-28-

CALCIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	18/05/79
Method Reference No.	E3146A	Units	mg/L as Ca
LIMS Product Code	CAT3146	Supervisor	J. McBride
Sample Type/Matrix	Precipitation		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.2 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
--------------------------------	------------------------	------------------------

CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

CALCIUM

QUALITY CONTROL DATA FROM 05/01/95 TO 10/12/96

Laboratory Unit: Atomic Absorption

Full Scale: to 2.0 mg/L as Ca

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	33	1.20	1.202	0.002	0.0113
B:	33	0.20	0.2002	0.0002	0.0075
A+B:	33	1.40	1.402	0.002	0.0151
A-B:	33	1.00	1.002	0.002	0.0119

s.d.(AB)

S(between runs): 0.010

Sw(within run): 0.008

S/Sw: 1.15

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.35 - 1.45 for A+B
0.96 - 1.04 for A-B

DUPLICATES:

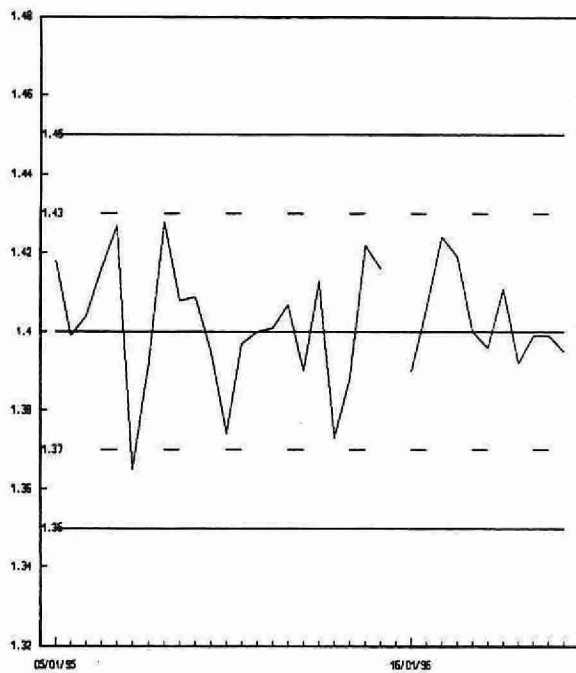
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
32	0.000 - 0.200	0.0066	15.4
15	0.201 - 0.400	0.0047	2.4
12	0.401 - 1.00	0.0111	2.8
12	1.001 - 2.00	0.0095	2.2
71	OVERALL	0.0076	

OTHER CHECKS:

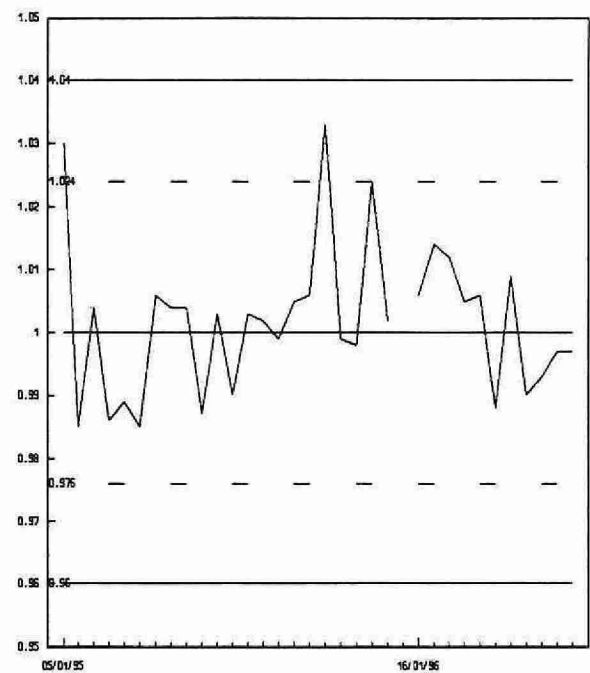
	n	Mean	Standard Deviation (1)
Long Term Blank	32	0.0025	0.0124

CALCIUM (mg/L as Ca)

QUALITY CONTROL DATA FROM 05/01/95 TO 10/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

CALCIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as Ca
LIMS Product Code	CAT3171,CA3171,HARD3171	Supervisor	J. McBride
Sample Type/Matrix	Surface Waters, DWSP Drinking Waters		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 1.14 at the full scale level.

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 11 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

CALCIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96

Laboratory Unit: Atomic Absorption

Full Scale: to 40.0 mg/L as Ca

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	212	32.0	32.1	0.1	0.3233
B:	212	8.00	8.09	0.09	0.1099
C:	212	2.00	2.02	0.02	0.0474
A+B:	212	40.0	40.2	0.2	0.3668
A-B:	212	24.0	24.02	0.02	0.3141
B+C:	212	10.0	10.11	0.11	0.1391
B-C:	212	6.00	6.07	0.07	0.0964

s.d.(AB) S(between runs): 0.24
s.d.(BC) S(between runs): 0.08

Sw(within run): 0.22
Sw(within run): 0.07

S/Sw: 1.1
S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

38.8 - 41.2 for A+B
23.1 - 24.9 for A-B
9.60 - 10.4 for B+C
5.70 - 6.30 for B-C

DUPLICATES:

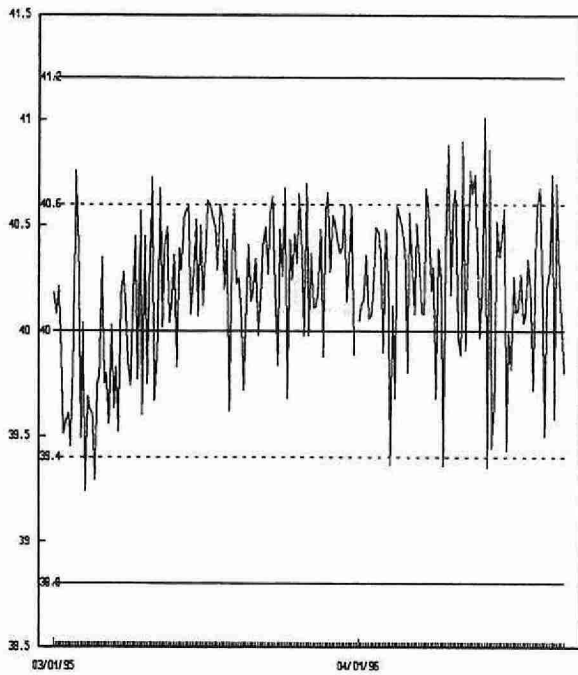
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
79	0.00 - 4.00	0.0713	4.6
41	4.01 - 8.00	0.0973	2.1
153	8.01 - 20.0	0.1830	1.7
152	20.1 - 40.0	0.3660	1.1
425	Overall	0.2140	

OTHER CHECKS:

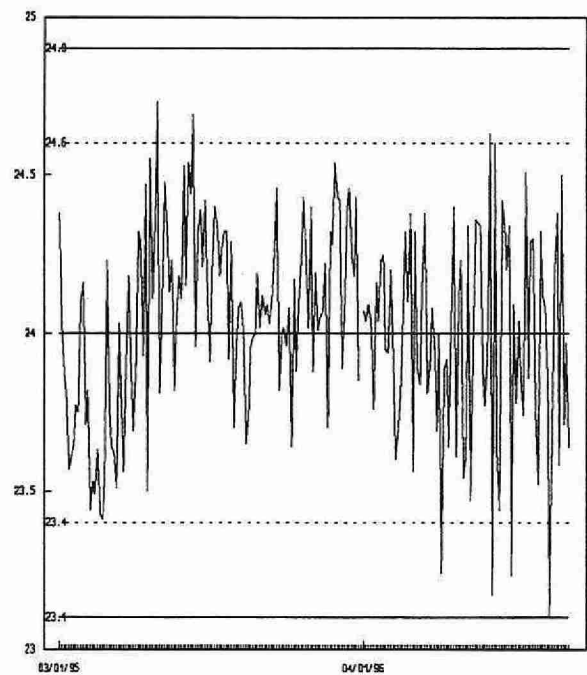
	n	Mean	Standard Deviation (1)
Long Term Blank	212	-0.0019	0.0353

CALCIUM (mg/L as Ca)

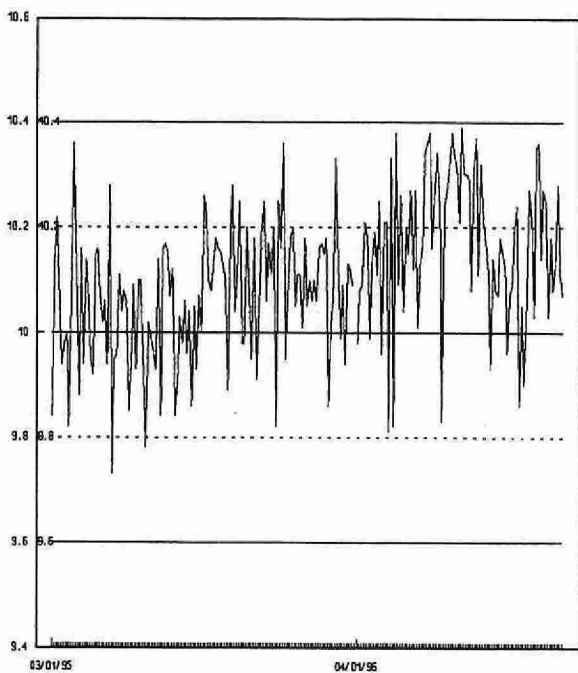
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96



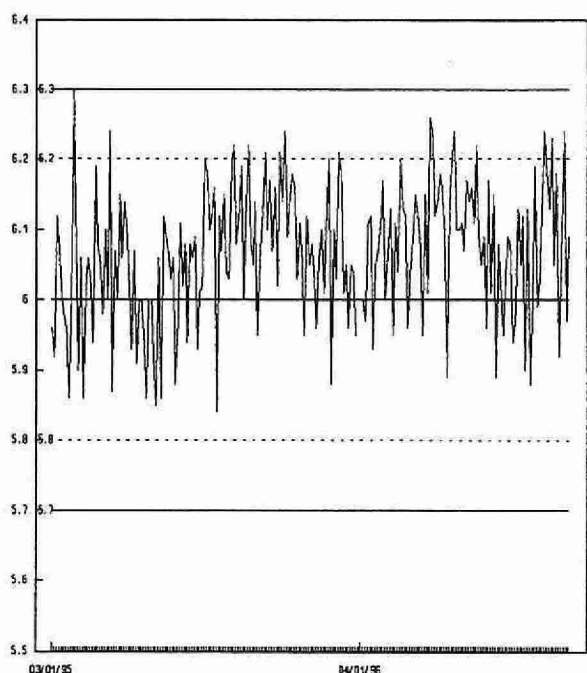
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
----- Warning Limit

CALCIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as Ca
LIMS Product Code	CAT3217,CATS3217,HARD3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage, Industrial Wastes		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 1.17 at the full scale level.

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

BL plus 11 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

CALCIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 30/12/96

Laboratory Unit: Absorption

Full Scale: to 200.0 mg/L as Ca

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	309	160.0	160.0	0.00	2.4893
B:	309	40.0	40.37	0.37	1.1068
C:	309	10.0	10.16	0.16	0.3775
A+B:	309	200.0	200.31	0.31	3.4270
A-B:	309	120.0	119.61	-0.39	2.1409
B+C:	309	50.0	50.51	0.51	1.4049
B-C:	309	30.0	30.19	0.19	0.8198

s.d.(AB) S(between runs): 1.93

Sw(within run): 1.51

S/Sw: 1.3

s.d.(BC) S(between runs): 0.83

Sw(within run): 0.58

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

190	-	210	for	A+B
113	-	127	for	A-B
44.5	-	54.5	for	B+C
27.0	-	33.0	for	B-C

DUPLICATES:

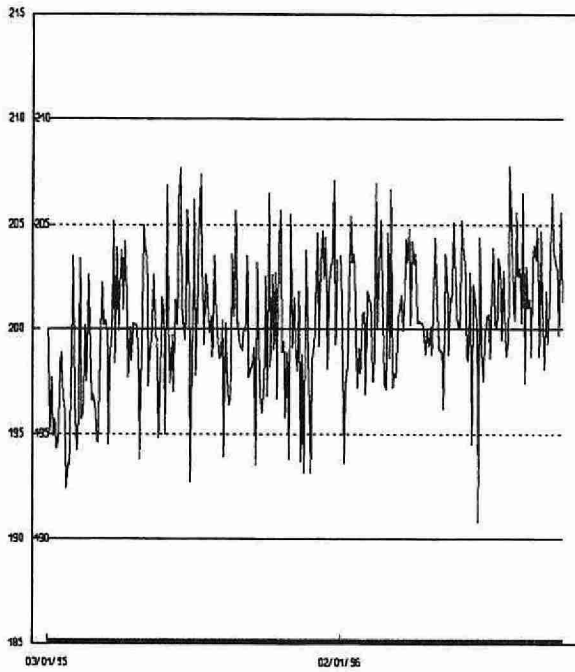
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
180	0.00 - 20.00	0.3311	4.0
209	20.01 - 40.00	0.8321	2.5
318	40.01 - 100.00	1.3447	4.2
158	100.01 - 200.00	2.3867	1.6
865	Overall	1.1676	

OTHER CHECKS:

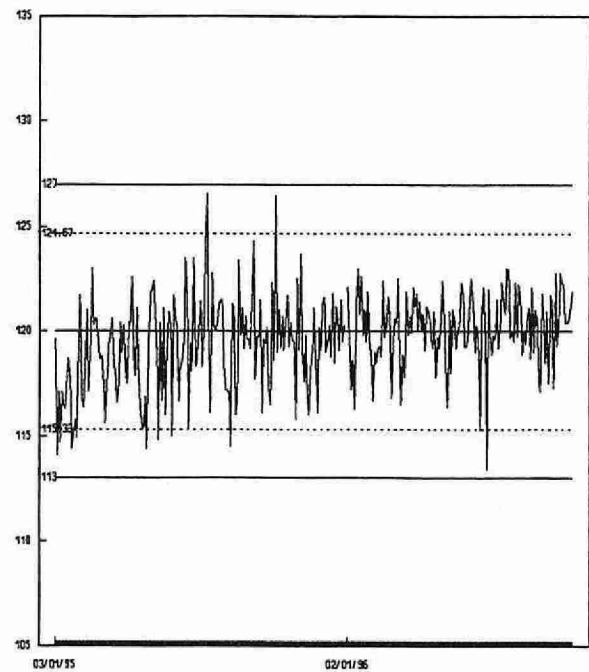
	n	Mean	Standard Deviation (1)
Long Term Blank	308	-0.0455	0.1451

CALCIUM (mg/L as Ca)

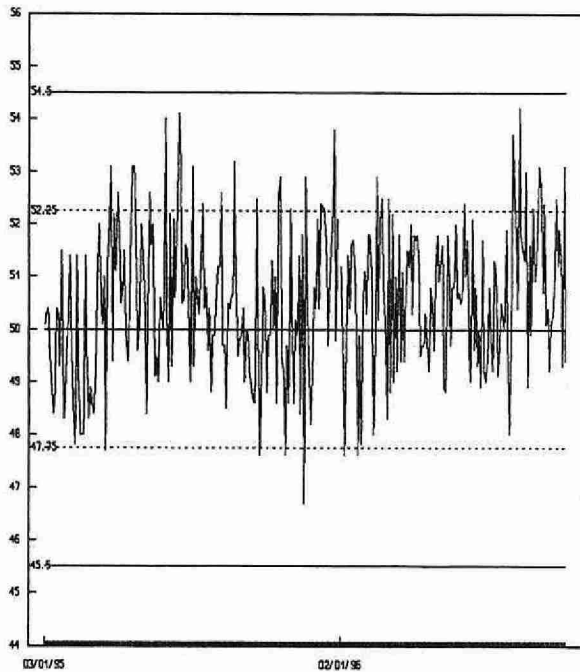
QUALITY CONTROL DATA FROM 03/01/95 TO 30/12/96



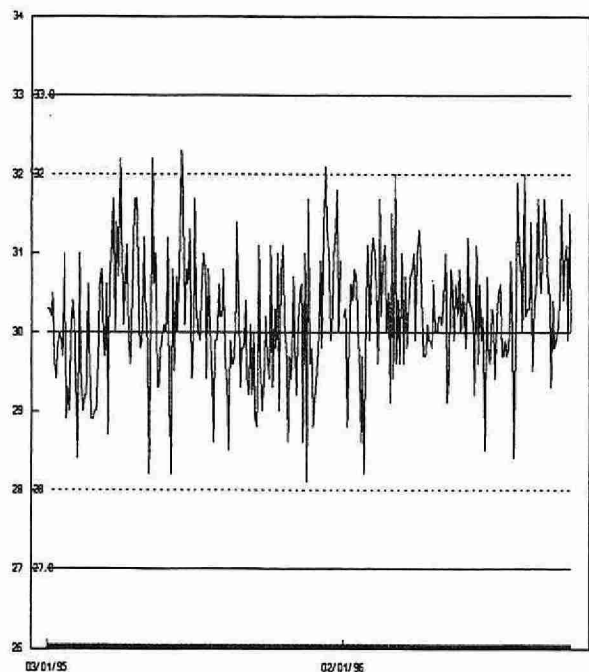
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

CALCIUM

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as Ca
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes,		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.2 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
--------------------------------	-----------------------	----------------------

CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

NOTES:

The control standards are corrected for the LTB from which they were made.

January to June 1996 QC data exceeded the limits on a number of occasions and as a result the uncertainty value associated with the reported data during this time period has been assessed to be ± 0.1 mg/L as Ca. (Further information can be attained from the lab (reference 1QCMEM98).

CALCIUM

QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/96

Laboratory Unit: Dorset

Full Scale: to 8.0 mg/L as Ca

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	95	6.4	6.407	0.007	0.0471
B:	95	1.6	1.599	-0.001	0.0307
C:	95	0.4	0.408	0.008	0.0090
A+B:	95	8.0	7.999	-0.001	0.0588
A-B:	95	4.8	4.808	0.008	0.0519
B+C:	95	2.0	2.000	0.000	0.0336
B-C:	95	1.2	1.191	-0.009	0.0301

s.d.(AB)	S(between runs):	0.039	Sw(within run):	0.037	S/Sw: 1.1
s.d.(BC)	S(between runs):	0.022	Sw(within run):	0.021	S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

7.85	-	8.15	for	A+B
4.69	-	4.91	for	A-B
1.95	-	2.05	for	B+C
1.16	-	1.24	for	B-C

DUPLICATES:

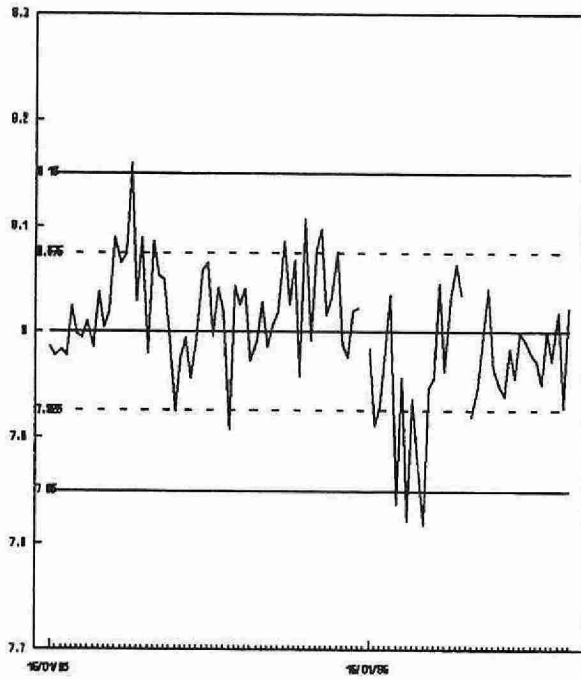
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
45	0.00 - 0.80	0.0064	3.1
36	0.81 - 1.60	0.0225	3.6
158	1.61 - 4.00	0.0400	3.1
16	4.01 - 8.00	0.0673	1.2
255	Overall	0.0319	

OTHER CHECKS:

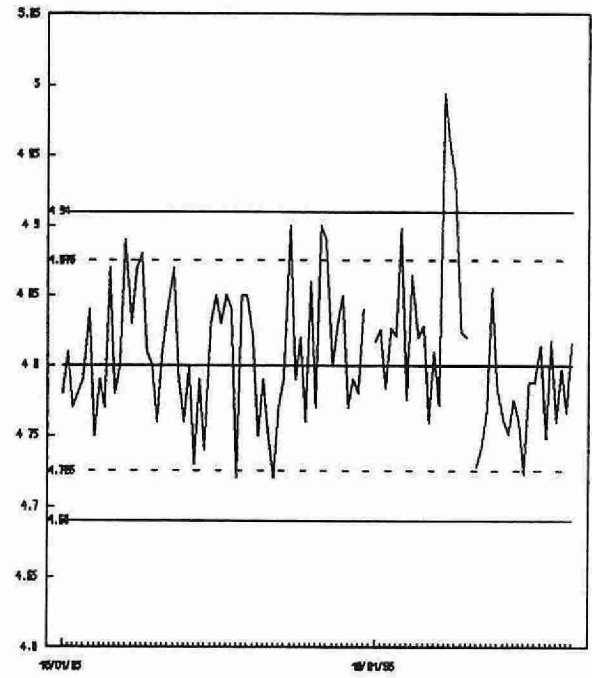
	n	Mean	Standard Deviation (1)
Long Term Blank	94	0.003	0.0085

CALCIUM (mg/L as Ca)

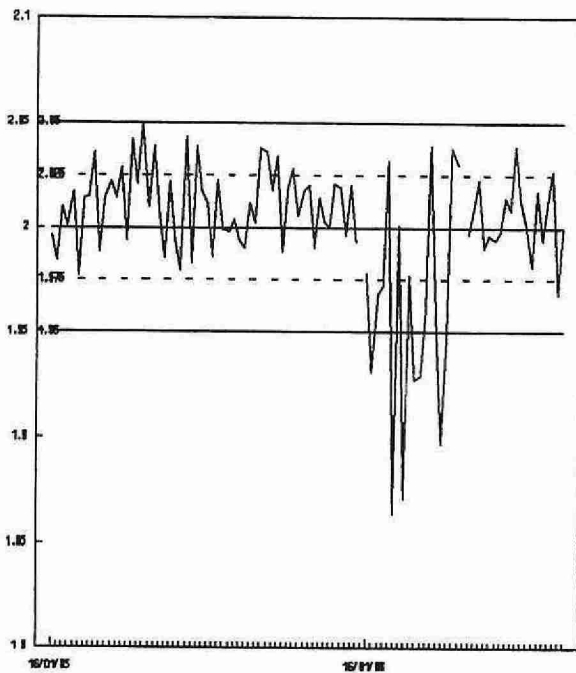
QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/96



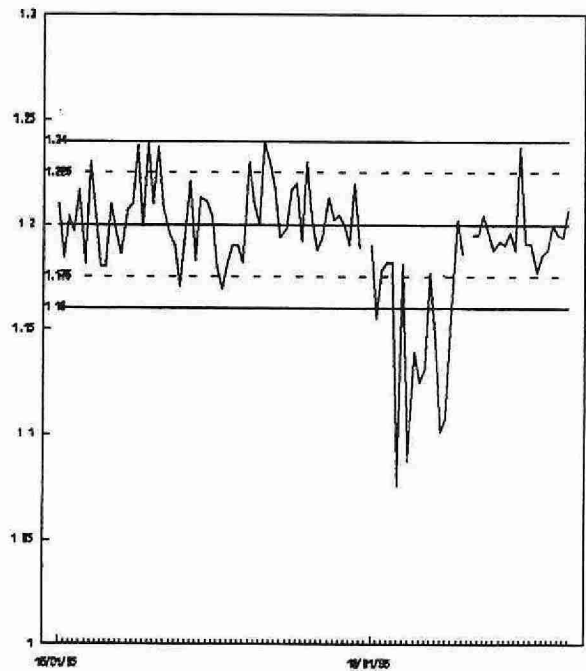
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

CARBON, DISSOLVED INORGANIC

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	03/06/80
Method Reference No.	E3028A	Units	mg/L as C
LIMS Product Code	CARB3028	Supervisor	J. McBride
Sample Type/Matrix	Streams, Lakes, Groundwater and Soil Leachates		

SAMPLING:

Quantity Required	50 mL
Container	Glass

ANALYTICAL PROCEDURE:

Dissolved inorganic carbon, which is determined colourimetrically on the supernatant of a settled sample, is converted to carbon dioxide gas by acidification. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved inorganic carbon content of the sample.

Approximate absorbance: 0.3 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: air (CO₂-free) supply, dialysis unit. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
--------------------------------	-----------------------	----------------------

CALIBRATION:

BL plus 9 standards daily

CONTROLS:

Calibration	LTB plus 3 standards, e.g. QCA, QCB, QCC
Drift	BL every 10 samples; BL plus 1 check standard every 20 samples

CARBON, DISSOLVED INORGANIC

QUALITY CONTROL DATA FROM 05/01/95 TO 19/12/96

Laboratory : Dorset

Full Scale: to 10.0 mg/L as C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	108	8.0	7.92	-0.08	0.1555
B:	108	4.0	3.94	-0.06	0.0917
C:	108	0.8	0.73	-0.07	0.0456
A+B:	108	12.0	11.86	-0.14	0.2211
A-B:	108	4.0	3.98	-0.02	0.1277
B+C:	108	4.8	4.67	-0.13	0.1214
B-C:	108	3.2	3.21	0.01	0.0792

s.d.(AB)	S(between runs):	0.13	Sw(within run):	0.09	S/Sw: 1.4
s.d.(BC)	S(between runs):	0.07	Sw(within run):	0.06	S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

11.4	-	12.6	for A+B
3.6	-	4.4	for A-B
4.4	-	5.2	for B+C
2.9	-	3.5	for B-C

DUPLICATES:

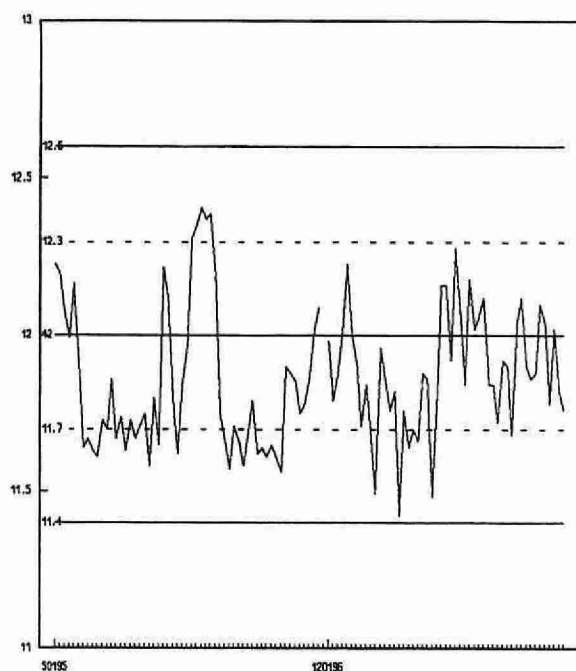
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
70	0.00 - 1.00	0.0166	2.3
112	1.01 - 2.00	0.0290	1.9
123	2.01 - 5.00	0.0801	2.8
14	5.01 - 10.0	0.1180	1.7
319	Overall	0.0426	

OTHER CHECKS:

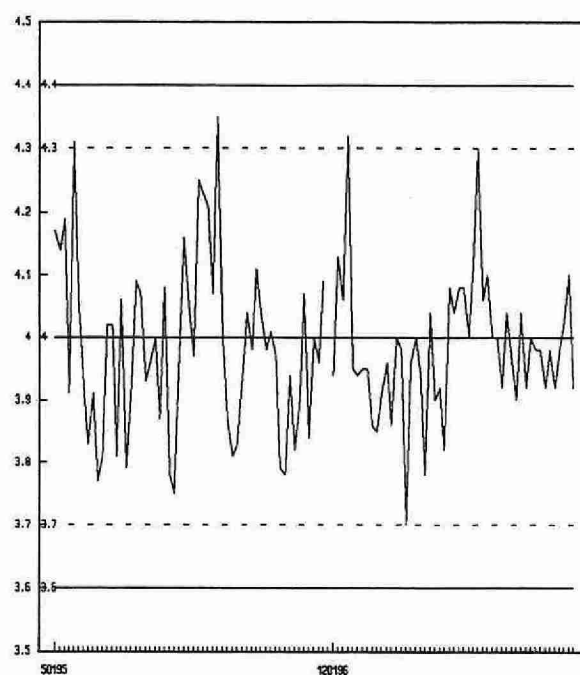
	n	Mean	Standard Deviation (1)
Long Term Blank	108	0.2217	0.0481

CARBON, DISSOLVED INORGANIC (mg/L as C)

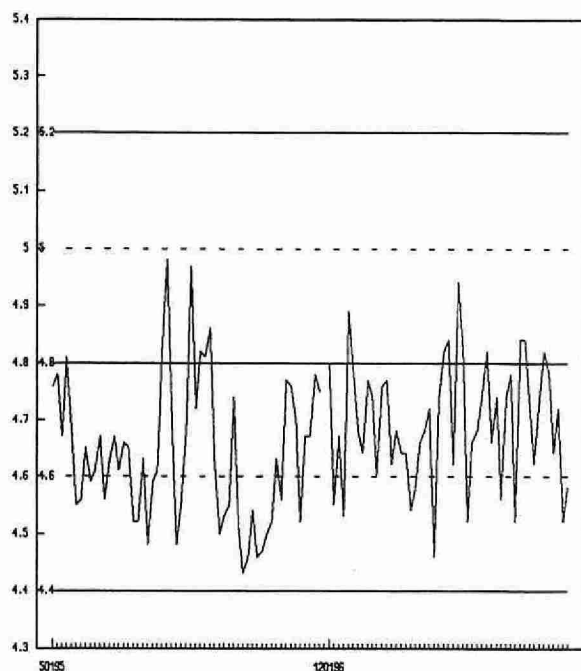
QUALITY CONTROL DATA FROM 05/01/95 TO 19/12/96



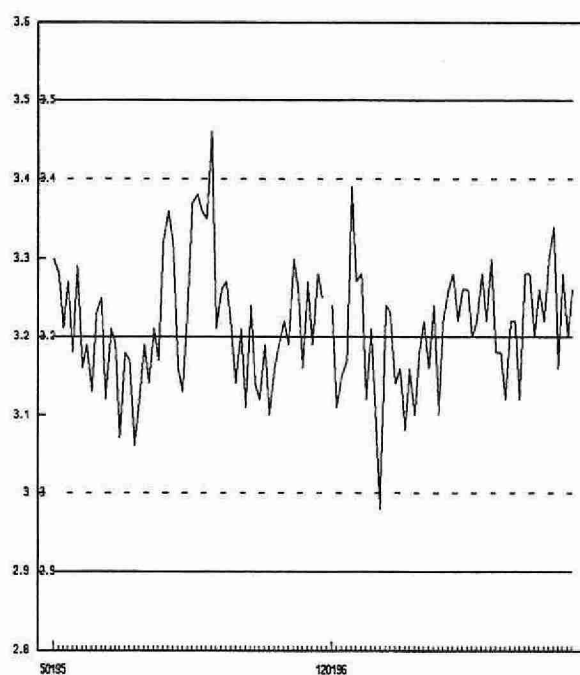
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

CARBON, DISSOLVED INORGANIC

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No.	E3370A	Units	mg/L as C
LIMS Product Code	DCSI3370	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Water Supplies, Leachates, Sewages, Industrial Wastes		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Dissolved inorganic carbon, which is determined colourimetrically on the supernatant of a settled sample, is converted to carbon dioxide gas by acidification. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved inorganic carbon content of the sample.

Approximate absorbance: 0.3 at the full scale level.

Dissolved organic carbon, and reactive silicates are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: air (CO₂-free) supply, dialysis unit. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1.0
--------------------------------	----------------------	----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; standard every 20 samples.

CARBON, DISSOLVED INORGANIC

QUALITY CONTROL DATA FROM 04/01/95 TO 171/12/96

Laboratory Unit: Colourimetry

Full Scale: to 80.0 mg/L as C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	248	64.0	64.15	0.15	0.4325
B:	248	16.0	15.97	-0.03	0.2790
C:	248	4.00	4.05	0.05	0.2091
A+B:	248	80.0	80.12	0.12	0.5224
A-B:	248	48.0	48.18	0.18	0.5068
B+C:	248	20.0	20.02	0.02	0.3909
B-C:	248	12.0	11.92	-0.08	0.3006

s.d.(AB) S(between runs): 0.36 Sw(within run): 0.36 S/Sw: 1.0
s.d.(BC) S(between runs): 0.25 Sw(within run): 0.21 S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

78.06 - 81.94 for A+B
46.55 - 49.45 for A-B
19.11 - 20.86 for B+C
11.35 - 12.65 for B-C

DUPLICATES:

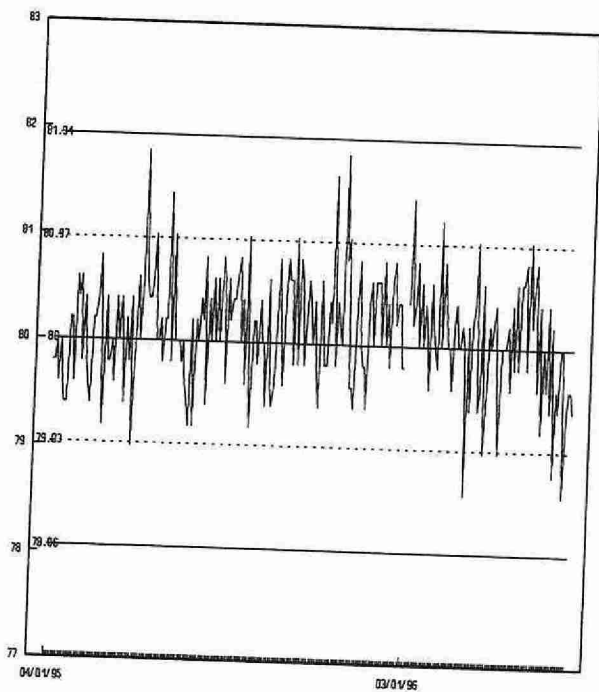
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
246	0.00 - 8.00	0.2842	23.0
38	8.01 - 16.0	0.2880	3.6
257	16.1 - 40.0	0.2883	1.9
169	40.1 - 80.0	0.5811	1.4
710	Overall	0.3439	

OTHER CHECKS:

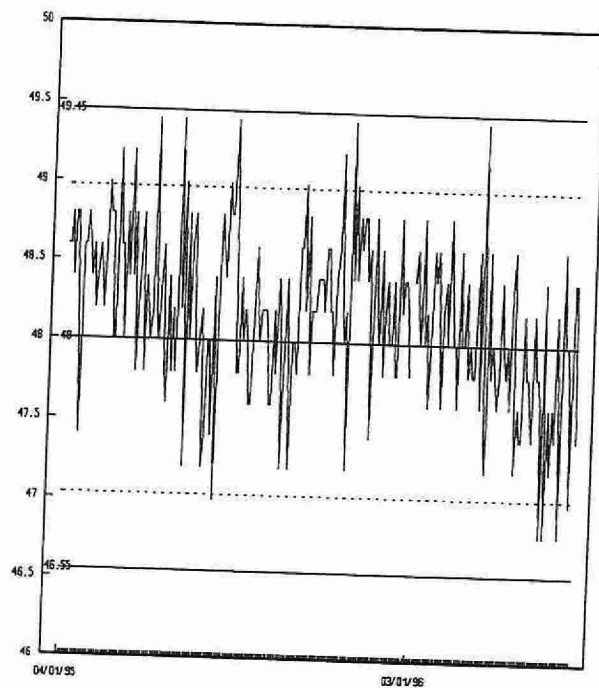
	n	Mean	Standard Deviation (1)
Long Term Blank	248	-0.0540	0.2258

CARBON, DISSOLVED INORGANIC (mg/L as C)

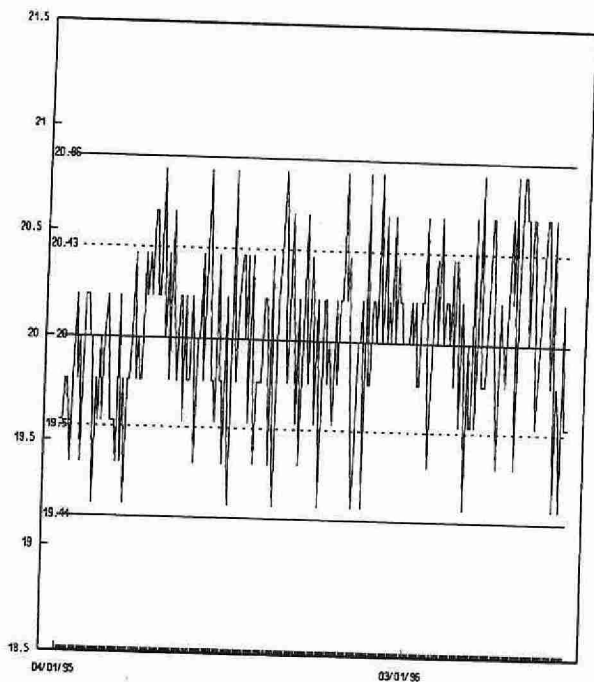
QUALITY CONTROL DATA FROM 04/01/95 TO 17/12/96



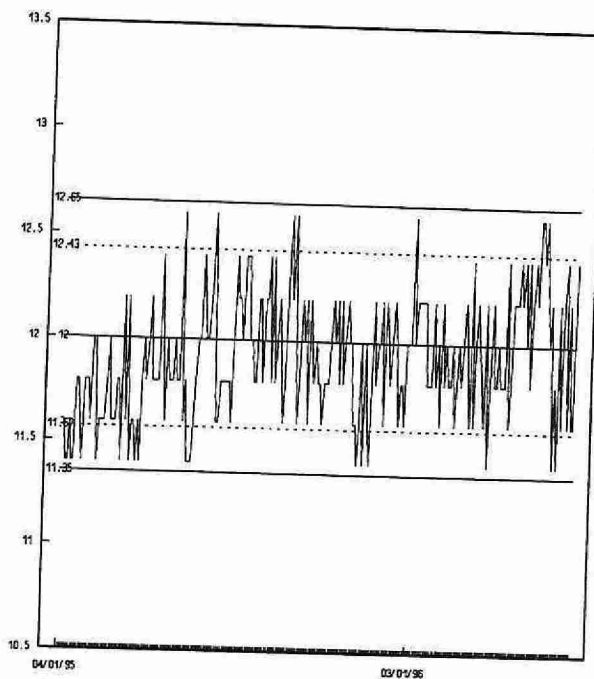
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

CARBON, DISSOLVED ORGANIC

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No.	E3370A	Units	mg/L as C
LIMS Product Code	DCSI3370	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Water Supplies, Leachates, Sewages, Industrial Wastes		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Using an automated system, the supernatant from a settled sample is acidified and flushed with nitrogen gas to remove inorganic carbon. Organic carbon is then oxidized to carbon dioxide gas by exposure to ultra-violet light (UV) in acid-persulphate media. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved organic carbon content of the sample.

Approximate absorbance: 0.3 at the full scale level.

Dissolved inorganic carbon, and reactive silicates are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: nitrogen and air (CO₂-free) supplies with flow controls, dialysis unit, UV digester. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.1	Current T value: 0.5
--------------------------------	----------------------	----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

CARBON, DISSOLVED ORGANIC

QUALITY CONTROL DATA FROM 04/01/95 TO 17/12/96

Laboratory Unit: Colourimetry

Full Scale: to 20.0 mg/L as C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	248	16.0	15.98	-0.02	0.1499
B:	248	4.00	3.96	-0.04	0.0869
C:	248	1.00	1.02	0.02	0.0725
A+B:	248	20.0	19.94	-0.06	0.1843
A-B:	248	12.0	12.03	0.03	0.1615
B+C:	248	5.00	4.98	-0.02	0.1227
B-C:	248	3.00	2.93	-0.07	0.1028

s.d.(AB) S(between runs): 0.122

Sw(within run): 0.114

S/Sw: 1.1

s.d.(BC) S(between runs): 0.080

Sw(within run): 0.073

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

19.44	-	20.56	for	A+B
11.58	-	12.42	for	A-B
4.72	-	5.28	for	B+C
2.79	-	3.21	for	B-C

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
287	0.00 - 2.00	0.0911	9.7
197	2.01 - 4.00	0.1218	6.5
205	4.01 - 10.0	0.1487	3.1
31	10.1 - 20.0	0.2606	1.6
720	Overall	0.1199	

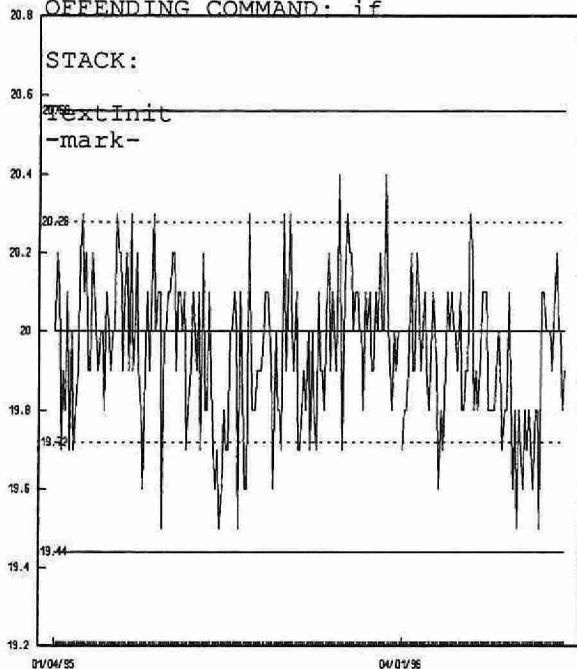
OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	248	0.0286	0.1054

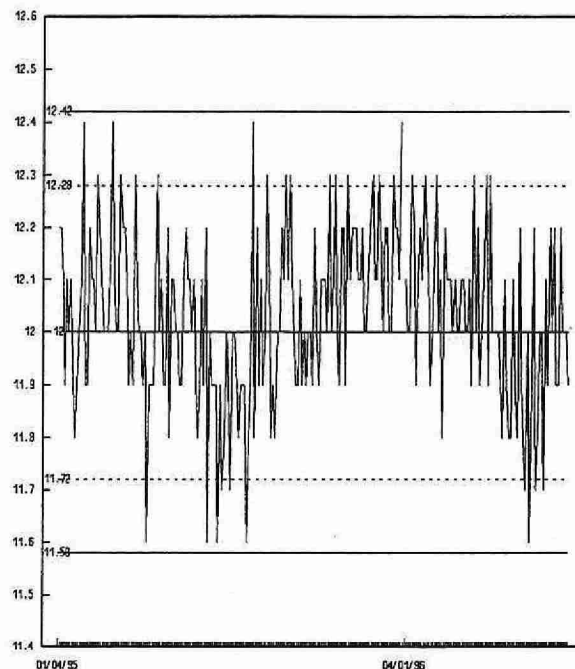
CARBON, DISSOLVED ORGANIC (mg/L as C)

QUALITY CONTROL DATA FROM 04/01/95 TO 17/12/96

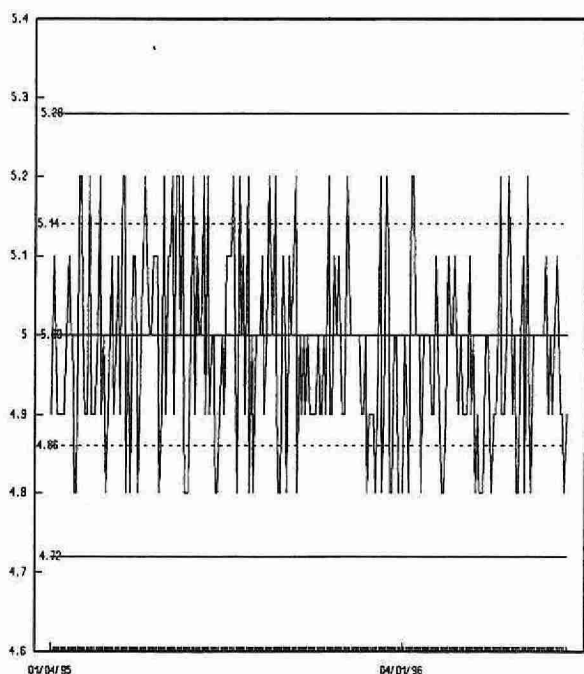
ERROR: typecheck
OFFENDING COMMAND: if



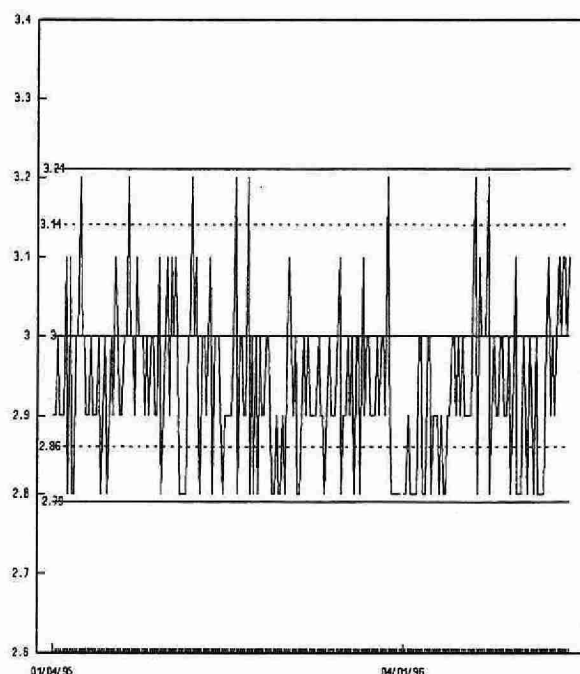
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
----- Warning Limit

CARBON, TOTAL ORGANIC

IDENTIFICATION:

Laboratory Unit	MISA	Method Introduced	08/12/93
Method Reference No.	E3247B	Units	mg/L as C
LIMS Product Code	CARB3247	Supervisor	J. McBride
Sample Type/Matrix	Industrial Effluents, and Sewage		

SAMPLING:

Quantity Required	500 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

If particles in the sample are greater than about 2 mm diameter the sample is homogenized and /or pH is lowered if necessary. Automated acidification and purging are done to remove any inorganic carbon at a temperature of 820 C. An IR detector measures the CO₂.

INSTRUMENTATION:

Dorhman DC-190 Carbon Analyzer.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

A solution of potassium biphthalate is used to calibrate the instrument.

CONTROLS:

Calibration	2 Calibration Control Standards, eg QCA.
Blanks	Pure-DW
Drift	25 ppm Check standard and a blank every 10 samples
Precision	Duplicate sample at least every 10 samples to a maximum of three

CARBON, TOTAL ORGANIC

QUALITY CONTROL DATA FROM 13/01/95 TO 13/12/96

Laboratory Unit: MISA

Full Scale: to 25 mg/L as C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	67	20.0	19.9	-0.1	0.7109
B:	67	5.0	4.98	-0.02	0.4864
A+B:	67	25.0	24.9	-0.1	1.0091
A-B:	67	15.0	14.9	-0.1	0.6825

s.d.(AB) S(between runs): 0.61 Sw(within run): 0.48 S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

22.9 - 27.1 for A+B
13.4 - 16.6 for A-B

DUPLICATES:

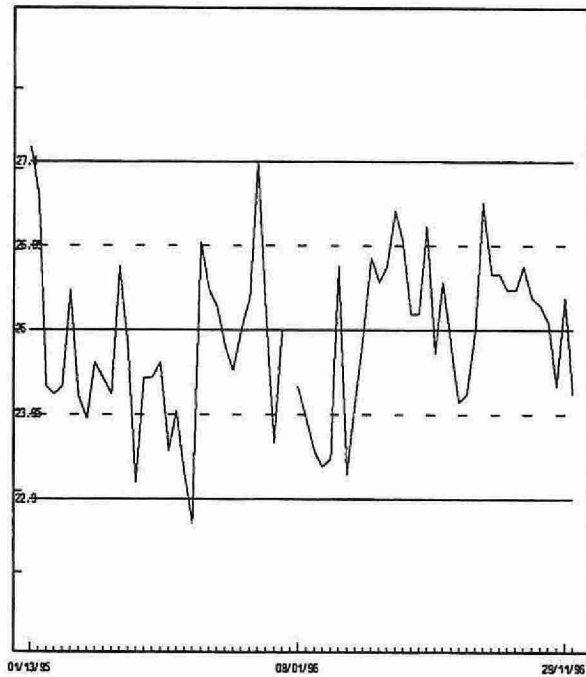
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
17	0.0 - 2.5	0.4413	23.7
29	2.6 - 5.0	0.2891	8.1
71	5.1 - 12.5	0.4887	7.7
31	12.6 - 25.0	0.7051	6.1
148	Overall	0.4969	

OTHER CHECKS:

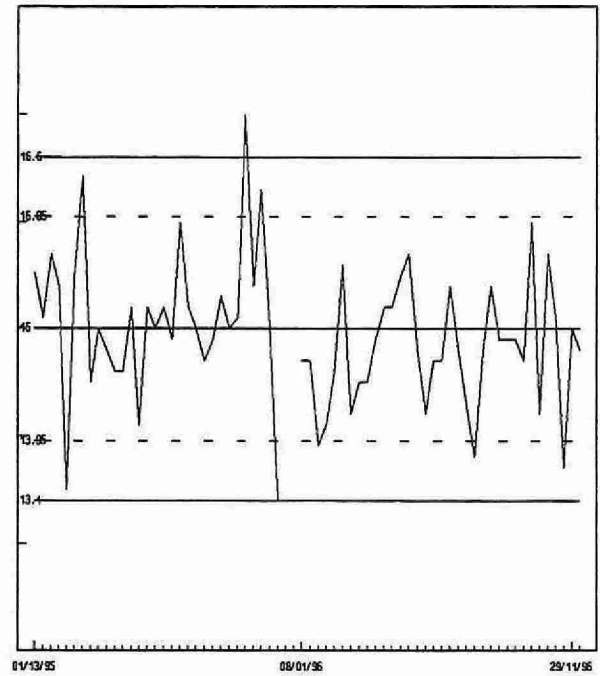
	n	Mean	Standard Deviation (1)
Method Blank	67	-0.0136	0.2609

CARBON, TOTAL ORGANIC (mg/L as C)

QUALITY CONTROL DATA FROM 13/01/95 TO 13/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

CARBON, TOTAL PARTICULATE

IDENTIFICATION:

Laboratory Unit	MISA	Method Introduced	08/12/93
Method Reference No.	E3141A	Units	mg/L as C
LIMS Product Code	CARB3141	Supervisor	J. McBride
Sample Type/Matrix	Surface water, effluents, and sewage		

SAMPLING:

Quantity Required	1 L
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Water is filtered and the filter is dried overnight at 103°C. The filter plus residue are placed in a combustion boat and burned in an oxygen atmosphere. An IR detector measures the CO₂ produced and is reported as percent carbon.

INSTRUMENTATION:

LECO CR-12 Carbon Determinator.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

A solution of potassium biphthalate is used to calibrate the instrument.

CONTROLS:

Calibration	2 Calibration Control Standards, eg QCA.
Blanks	Treated and untreated filters every 10 samples.
Drift	0.01 - 0.015 g KHP check standard
Precision	Duplicate sample at least every 10 samples to a maximum of three

CARBON, TOTAL PARTICULATE

QUALITY CONTROL DATA FROM 01/01/94 TO 31/12/96

Laboratory Unit: MISA

Full Scale: to 100 mg/L as C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	17	32.0	33.73	1.73	1.45
B:	17	12.0	12.12	0.12	0.38
A+B:	17	44.0	45.86	1.86	1.51
A-B:	17	20.0	21.61	1.61	1.50

s.d.(AB) S(between runs): 1.13 Sw(within run): 1.12 S/Sw: 1.0
The calibration is accepted if the calibration control values obtained lie within the ranges:

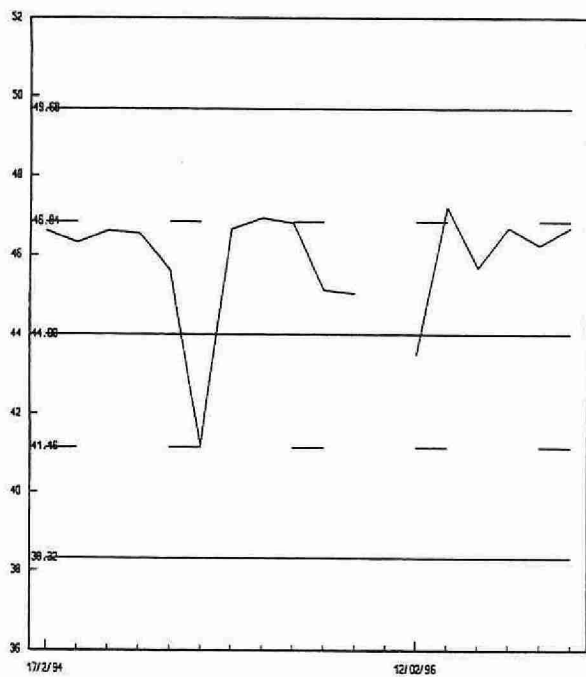
38.32 - 49.68 for A+B
15.74 - 24.26 for A-B

DUPLICATES:

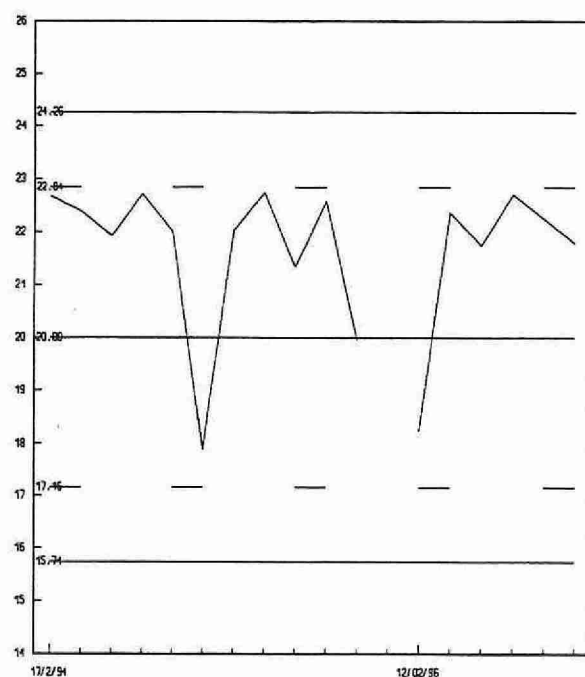
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
24	0 - 10.0	0.411	40.7
3	10.1 - 50.0	5.473	11.5
1	50.1 - 100	N.A.	N.A.
28	Overall	0.7075	

CARBON, TOTAL PARTICULATE (mg/L as C)

QUALITY CONTROL DATA FROM 01/01/94 TO 31/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
 ----- Warning Limit

CHLORIDE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3004A	Units	$\mu\text{g}/\text{m}^3$ as Cl
LIMS Product Code	ANION3004	Supervisor	J. McBride
Sample Type/Matrix	Glass fibres and high purity quartz filters (Ag and Aq)		

SAMPLING:

Quantity Required	3/4" or 1.9cm strip from 8"x10" filter
Container	50 mL polypropylene tube

SAMPLING PREPARATION:

A 3/4" filter strip is cut in pieces and deposited into a 50 mL polypropylene tube. 50 mL of Pure-Water is added to the tube. The tube is placed on a horizontal shaker for approximately 1 hour. The supernatant is then filtered into a 15 mL plastic tube and analysed.

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of sodium bicarbonate and sodium carbonate and a conductivity detector. The concentration of chloride (mg/L) is determined by the comparison of the analyte peak area count to that of a series of standards. The analyte result is corrected for the filter blank before the final calculation. The result is reported as $\mu\text{g}/\text{m}^3$ as Cl.

Nitrate and sulphate are determined simultaneously.

INSTRUMENTATION:

Horizontal Shaker, ion chromatographic system plus a PC with ChromPerfect software and DT2804 card for automated sample injection, timing, and data processing.

REPORTING:

Maximum Significant Figures: 2	Current W value: $0.1 \mu\text{g}/\text{m}^3$	Current T value: $0.5 \mu\text{g}/\text{m}^3$
--------------------------------	---	---

CALIBRATION:

6 standards

CONTROLS:

Calibration	MB, IS(n), CS1, and CS2
Drift	Duplicate plus 2 standards approximately every 20 samples

CHLORIDE cont'd

NOTES:

Duplicate criterion is based on duplicate analysis of the same filter because duplicate filters are not received. To convert unit from mg/L to $\mu\text{g}/\text{m}^3$, the final concentration of Cl in mg/L is multiplied by the following formula:

$$\text{Result}(\text{mg/L}) \times 50\text{mL} \times (63/6.75) / \text{air volume} = \mu\text{g./m}^3$$

Where: 63 is the area of the filter exposed and 6.75 is the sample aliquot are (in^2)

CHLORIDE

QUALITY CONTROL DATA FROM 02/07/96 TO 31/01/96

Laboratory Unit: Ion Chromatography

Full Scale: to 14.7 $\mu\text{g}/\text{m}^3$ as Cl

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
64	0 - 0.294	0.0720	6.7
5	0.295 - 7.35	0.1463	0.9
2	7.35 - 14.7	N.A.	N.A.
71	Overall	0.0889	

CHLORIDE

IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	01/05/75
Method Reference No:	E3016A	Units:	mg/L as Cl
LIMS Product Code:	CL3016	Supervisor:	J. McBride
Sample Type/Matrix:	Rivers(non-APIOS), Lakes Soil Extracts, Effluents, Domestic Water Supplies, Leachates, Sewages, Industrial Wastes		

SAMPLING:

Quantity Required:	10 mL
Container:	Plastic

ANALYTICAL PROCEDURE:

Chloride ions are combined with mercuric thiocyanate releasing thiocyanate quantitatively. Thiocyanate then reacts with ferric ions to produce ferric thiocyanate (red), and the absorbance of the latter is measured colourimetrically. Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 1.5 cm light path at 480 nm. Data capture, reduction, and processing via a multistage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration:	LTBL plus 3 standards, e.g. QCA
Drift:	BL every 10 samples; standard every 20 samples

CHLORIDE

QUALITY CONTROL DATA FROM 04/01/95 TO 31/12/96

Laboratory Unit: Colourimetry

Full Scale: to 100 mg/L as Cl

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	191	75.0	75.3	0.3	0.3627
B:	191	25.0	25.08	0.08	0.1377
C:	191	5.00	4.98	-0.02	0.0801
A+B:	191	100.0	100.4	0.4	0.4145
A-B:	191	50.0	50.25	0.25	0.3595
B+C:	191	30.0	30.06	0.06	0.1787
B-C:	191	20.0	20.09	0.09	0.1372

s.d.(AB) S(between runs): 0.27

Sw(within run): 0.25

S/Sw: 1.1

s.d.(BC) S(between runs): 0.11

Sw(within run): 0.10

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

98.8	-	101.2	for	A+B
49.2	-	50.8	for	A-B
29.3	-	30.7	for	B+C
19.55	-	20.45	for	B-C

DUPLICATES:

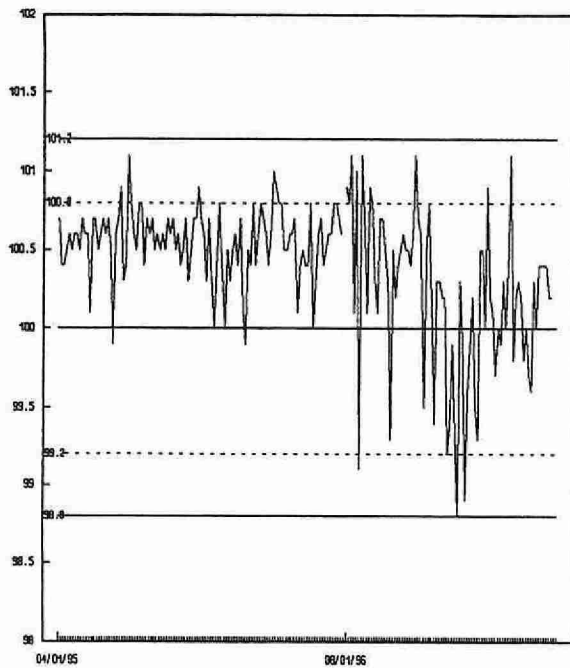
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
162	0.00 - 10.0	0.0760	5.7
111	10.1 - 20.0	0.1257	4.7
147	20.1 - 50.0	0.2153	7.6
78	50.1 - 100	0.4493	4.5
498	Overall	0.1619	

OTHER CHECKS:

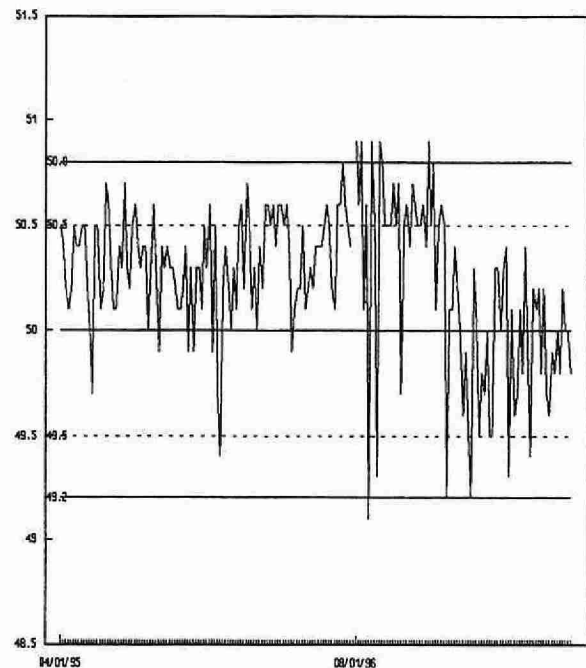
	n	Mean	Standard Deviation (1)
Long Term Blank	191	-0.072	0.1455

CHLORIDE (mg/L as Cl)

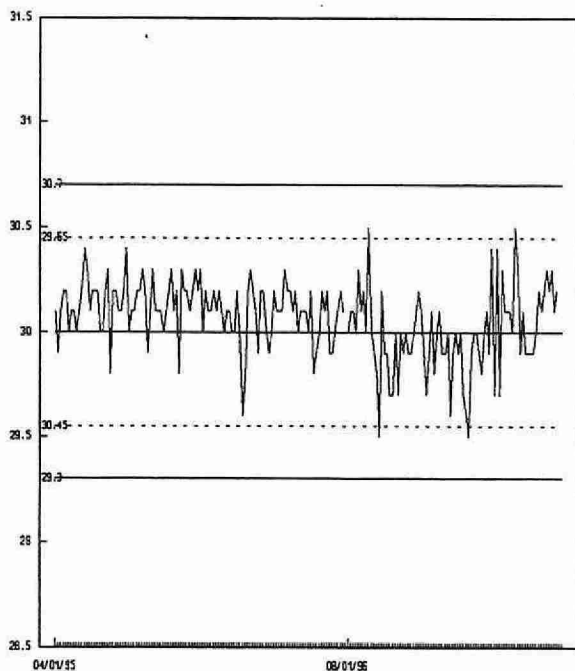
QUALITY CONTROL DATA FROM 04/01/95 TO 31/12/96



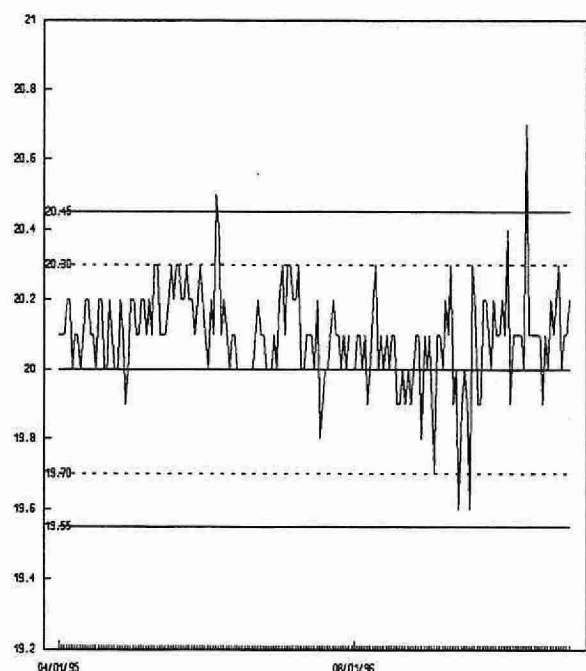
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 - - - - - Warning Limit

CHLORIDE

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/04/78
Method Reference No.	E3147A	Units	mg/L as Cl
LIMS Product Code	ANION3147	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample peak heights to a series of standards.

Sulphate is determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	1 standard every 10 samples.

CHLORIDE

QUALITY CONTROL DATA FROM 04/01/95 TO 18/12/96

Laboratory Unit: Dorset

Full Scale: to 2.0 mg/L as Cl

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	76	1.60	1.606	0.006	0.0152
B:	76	0.40	0.407	0.007	0.0116
A+B:	76	2.00	2.019	0.019	0.0218
A-B:	76	1.20	1.198	-0.002	0.0154

s.d.(AB) S(between runs): 0.013 Sw(within run): 0.011 S/Sw: 1.23

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.92 - 2.08 for A+B
1.14 - 1.26 for A-B

DUPLICATES:

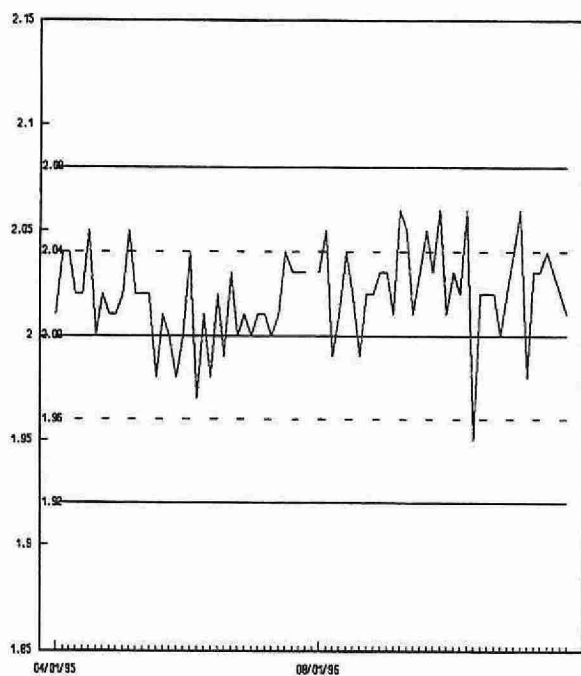
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
51	0.10 - 0.20	0.0083	8.3
127	0.21 - 0.40	0.0075	2.7
56	0.41 - 1.00	0.0092	2.2
25	1.01 - 2.00	0.0186	1.4
259	Overall	0.0088	

OTHER CHECKS:

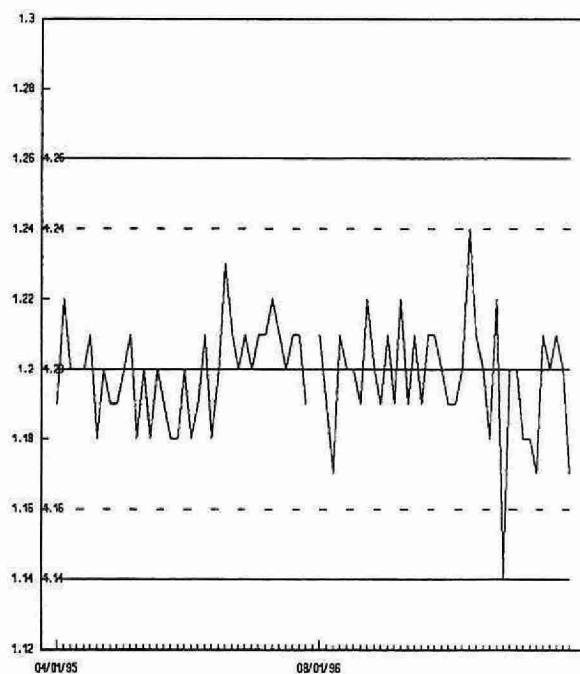
	n	Mean	Standard Deviation (1)
Long Term Blank	76	-0.0078	0.0090

CHLORIDE (mg/L as Cl)

QUALITY CONTROL DATA FROM 04/01/95 TO 18/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
 ----- Warning Limit

CHLORIDE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3148A	Units	µg/Filter as Cl
LIMS Product Code	LOV3148, ANLOV3148	Supervisor	J. McBride
Sample Type/Matrix	W40 filters from LoVol filter packs		

SAMPLING:

Quantity Required	1 filter
Container	50 mL polypropylene tube

SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW in polypropylene tubes with ultrasonic treatment followed by a 24 hour rest period.

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample peak heights to a series of standards. Results are converted to µg/filter as Cl.

Nitrogen-nitrate and sulphate are determined simultaneously.

INSTRUMENTATION:

Ultrasonic bath; modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02 mg/L	Current T value: 0.10 mg/L
--------------------------------	----------------------------	----------------------------

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received. To convert unit from mg/L to µg/Filter, the concentration of Cl in mg/L is multiplied by 50 for the W40 filters.

CHLORIDE

QUALITY CONTROL DATA FROM 13/01/95 TO 13/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 2.0 mg/L as Cl

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	46	1.60	1.6004	0.0004	0.0154
B:	46	0.40	0.398	-0.002	0.0108
A+B:	46	2.00	1.998	-0.002	0.0227
A-B:	46	1.20	1.203	0.003	0.0140

s.d.(AB) S(between runs): 0.0133 Sw(within run): 0.0099 S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.93 - 2.07 for A+B
1.15 - 1.25 for A-B

DUPLICATES:

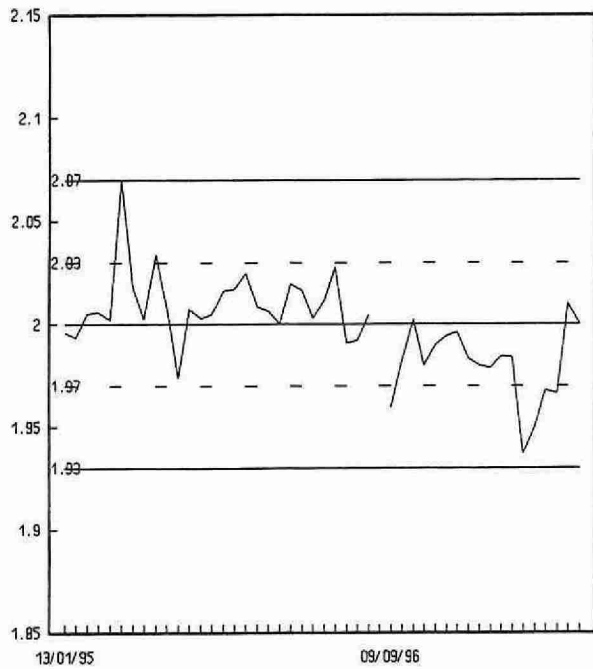
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
18	0 - 0.40	0.0023	1.2
16	0.41 - 1.00	0.0053	0.8
3	1.01 - 2.00	0.0071	0.8
37	Overall	0.0042	

OTHER CHECKS:

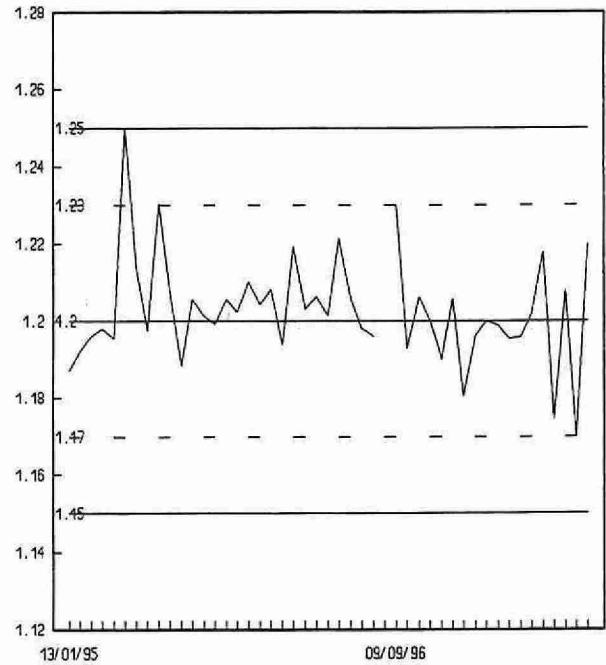
	n	Mean	Standard Deviation (1)
Long Term Blank	46	0	0

CHLORIDE (mg/L as Cl)

QUALITY CONTROL DATA FROM 13/01/95 TO 13/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

CHLORIDE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3372A	Units	mg/L as Cl
LIMS Product Code	ANION3372	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

SAMPLING:

Quantity Required	15 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample peak heights to a series of standards. Nitrogen-nitrate and sulphate are determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Same analytical method as E3147A operating in Dorset Lab. New method number introduced for Toronto Lab in 1993 is E3372A.

CHLORIDE

QUALITY CONTROL DATA FROM 12/01/95 TO 10/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 1.0 mg/L as Cl

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	34	0.80	0.807	0.007	0.0113
B:	34	0.20	0.204	0.004	0.0091
A+B:	34	1.00	1.011	0.011	0.0160
A-B:	34	0.60	0.603	0.003	0.0128

s.d.(AB) S(between runs): 0.010 Sw(within run): 0.009 S/Sw: 1.13

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.96 - 1.04 for A+B
0.57 - 0.63 for A-B

DUPLICATES:

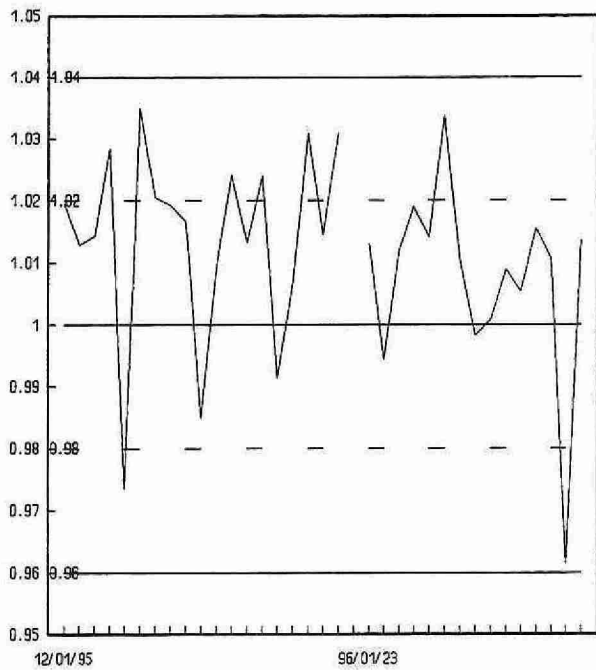
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
29	0 - 0.20	0.0097	13.2
9	0.21 - 0.50	0.0075	2.4
0	0.51 - 1.00	N.A.	N.A.
38	Overall	0.0091	

OTHER CHECKS:

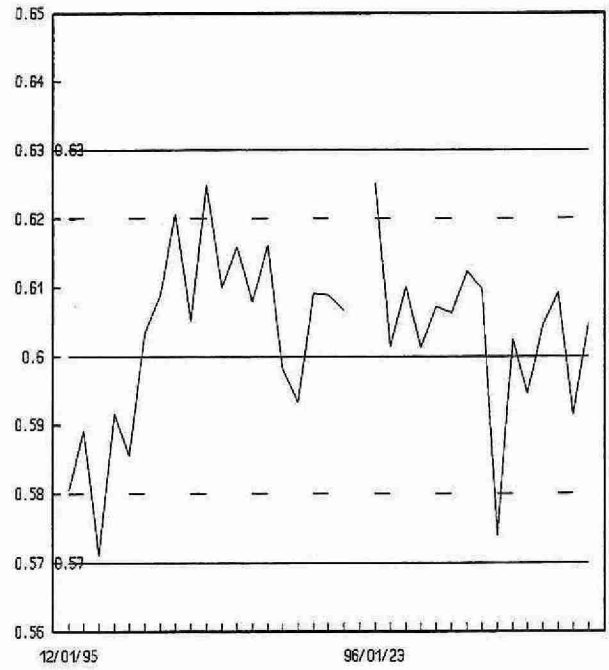
	n	Mean	Standard Deviation (1)
Long Term Blank	34	0.0012	0.0031

CHLORIDE (mg/L as Cl)

QUALITY CONTROL DATA FROM 12/01/95 TO 10/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

CHLORINE, TOTAL RESIDUAL

IDENTIFICATION:

Laboratory Unit:	MISA	Method Introduced:	08/03/93
Method Reference No:	E3309A	Units:	µg/L as Cl ₂
LIMS Product Code:	RCL3309	Supervisor:	J. McBride
Sample Type/Matrix:	Industrial Waste , Sewage, Surface and Treated Drinking Water		

SAMPLING:

Quantity Required:	1 L
Container:	Narrow neck low actinic glass

ANALYTICAL PROCEDURE:

Samples are analyzed by amperometric titration. The sample pH is adjusted to between 3.5 and 4.5 with acetate buffer and excess KI is added.

INSTRUMENTATION:

Autoburette

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
--------------------------------	--------------------	---------------------

CALIBRATION:

None

CONTROLS:

Performance Check	BL plus 2 QC standards, e.g., QCA
-------------------	-----------------------------------

NOTES:

Results recorded for duplicates are based upon final concentrations. The results from various sample aliquots are indicated in each of the concentration spans.

CHLORINE, TOTAL RESIDUAL

QUALITY CONTROL DATA FROM 03/01/95 TO 31/12/96

Laboratory Unit: MISA

Full Scale: to 50.0 µg/L as Cl₂

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	89	40.0	39.8	-0.2	1.5831
B:	89	10.0	10.7	0.7	1.2918
A+B:	89	50.0	50.5	0.5	2.4749
A-B:	89	30.0	29.1	-0.9	1.4256

s.d.(AB) S(between runs): 1.44 Sw(within run): 1.01 S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

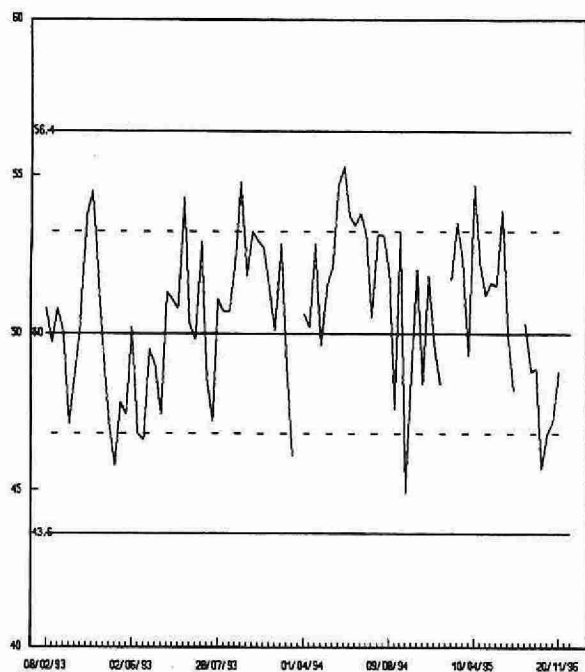
43.6 - 56.4 for A+B
25.2 - 34.8 for A-B

DUPLICATES:

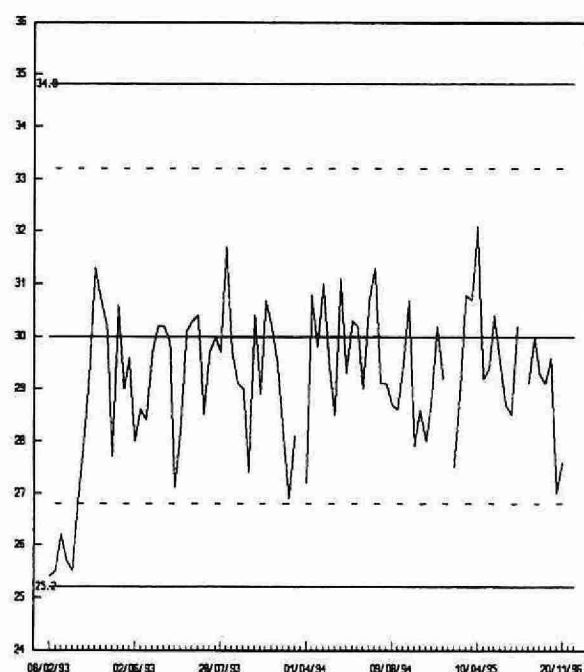
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
10	0 - 10	0.7091	11.9
28	11 - 25	0.5991	4.4
21	26 - 50	0.7157	3.2
12	51 - 100	2.8013	3.4
33	101 - 700	11.621	3.1
94	Overall	3.0323	

CHLORINE TOTAL RESIDUAL ($\mu\text{g/L}$ as Cl_2)

QUALITY CONTROL DATA FROM 08/02/93 TO 31/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

CHLOROPHYLL

IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	01/04/75
Method Reference No:	E3169A	Units:	µg/L
LIMS Product Code:	CHL3169	Supervisor:	J. McBride
Sample Type/Matrix:	Rivers, Lakes, Effluents		

SAMPLING:

Quantity Required	1000 mL for clear samples; 500 mL if visibly green
Container	Glass or plastic
Other	In the field a sample is filtered through a nylon filter. The filter is folded and then placed between two membrane filter-support pads, and the package is enclosed in a plastic dish labelled with the sample number and sample volume filtered, the dish is kept in the dark or wrapped in aluminum foil, and shipped immediately, or kept frozen.

ANALYTICAL PROCEDURE:

Using a Commodore PET microcomputer-controlled, automated spectrophotometer, two scans are developed with absorbance measurements at 630, 645, and 663 nm for the first scans; the minimum absorbance value between 710 and 750 nm (readings at 5 nm intervals) is utilized as a turbidity correction. Chlorophyll "a" and "b" are calculated from this scan. After automated acidification, the second scan is obtained from the wavelength 665 nm for correcting chlorophyll "a" measurement. SCOR-UNESCO equations are used for all chlorophyll calculations.

INSTRUMENTATION:

- Automated modular continuous flow scanning spectrophotometer system
- Microcomputer system for control of sampling, timing and data processing (i.e. data capture, calculations and transfer of results to LIMS)

REPORTING:

Chlorophyll a; corrected	Maximum Significant	Current W value: 1.0	Current T value: 5.0
Chlorophyll a; total	Figures: 3	Current W value: 0.2	Current T value: 1.0
Chlorophyll b; total		Current W value: 0.1	Current T value: 0.5

CONTROLS:

Calibration	LTBL plus 2 "standards", e.g.QCA
Drift	"standard", BL every 20 samples

NOTES:

"Standards" are prepared from chlorophyll "a" and "b", but the materials are neither analytical grade nor are their solutions stable. Thus calibration controls are based on measured averages.

CHLOROPHYLL "a"

QUALITY CONTROL DATA FROM 06/01/95 TO 11/12/96

Laboratory Unit: Colourimetry

Reporting Unit: µg/L

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	158	3.0	3.010	0.010	0.0928
B:	158	1.0	0.992	-0.008	0.0639
A+B:	158	4.0	4.002	0.002	0.1052
A-B:	158	2.0	2.017	0.017	0.1198

s.d.(AB) S(between runs): 0.08 Sw(within run): 0.085 S/Sw: 0.9

The calibration is accepted if the calibration control values obtained lie within the ranges:

3.6 - 4.4 for A+B
1.7 - 2.3 for A-B

DUPLICATES:

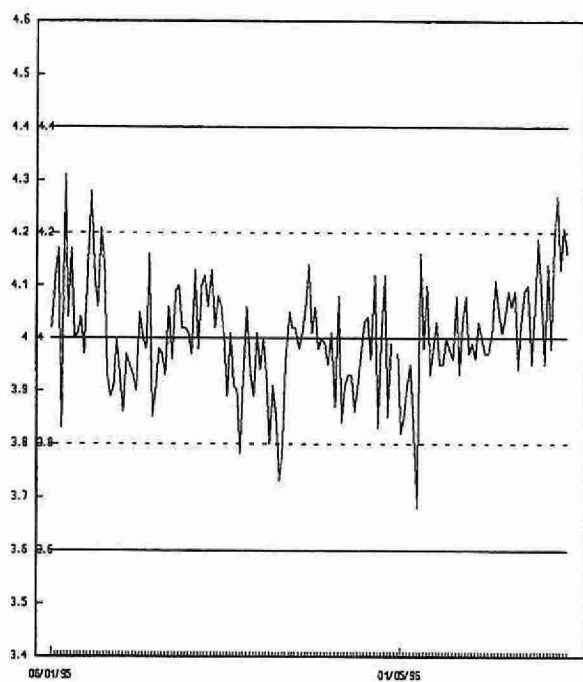
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
189	-0.17 - 5.0	0.1643	16.4
42	5.1 - 10.0	0.4900	8.9
24	10.1 - 25.0	0.9944	6.0
8	25.1 - 50.0	2.3215	6.0
23	50.1 - 420	10.223	8.5
286	Overall	0.3838	

OTHER CHECKS:

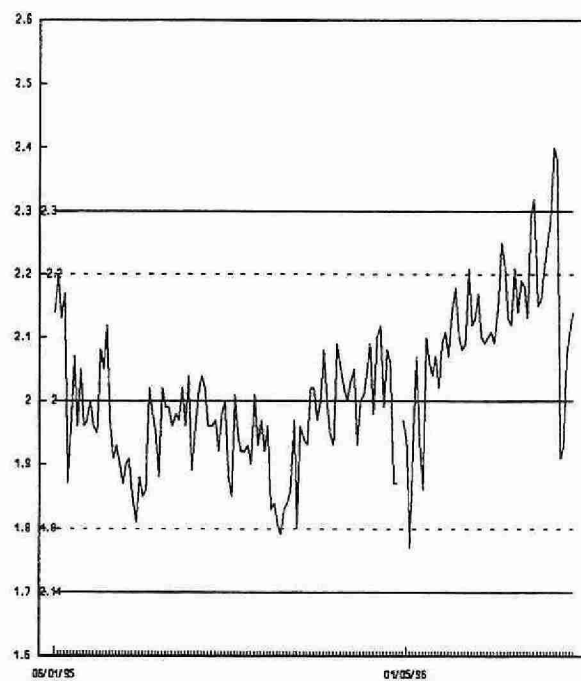
	n	Mean	Standard Deviation (1)
Long Term Blank	158	0.0542	0.0524
Filtered Blank	158	0.0555	0.0620

CHLOROPHYLL, "a" ($\mu\text{g/L}$)

QUALITY CONTROL DATA FROM 06/01/95 TO 12/11/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
 ----- Warning Limit

CHLOROPHYLL "a", ACIDIFIED

QUALITY CONTROL DATA FROM 06/01/95 TO 12/11/96

Laboratory Unit: Colourimetry

Reporting Unit: µg/L

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	158	2.4	2.624	0.224	0.1603
B:	158	0.8	0.827	-0.027	0.1122
A+B:	158	3.2	3.451	0.251	0.2166
A-B:	158	1.6	1.797	0.197	0.1723

s.d.(AB)

S(between runs): 0.14

Sw(within run): 0.12

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.4 - 4.0 for A+B
1.0 - 2.2 for A-B

DUPLICATES:

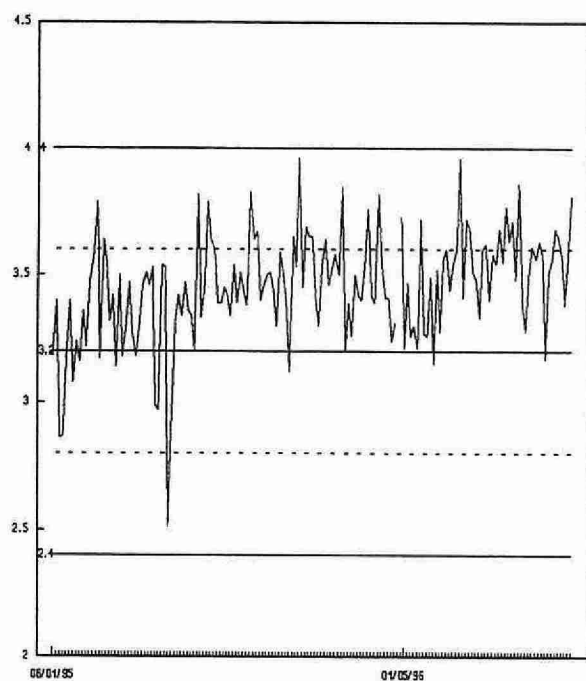
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
124	-0.34 - 1.0	0.2198	119.0
40	1.1 - 2.0	0.3569	28.2
54	2.1 - 5.0	0.4158	14.3
33	5.1 - 10.0	0.8029	14.8
40	10.1 - 100	4.9236	18.7
6	101 - 300	15.941	8.8
297	Overall	0.5195	

OTHER CHECKS:

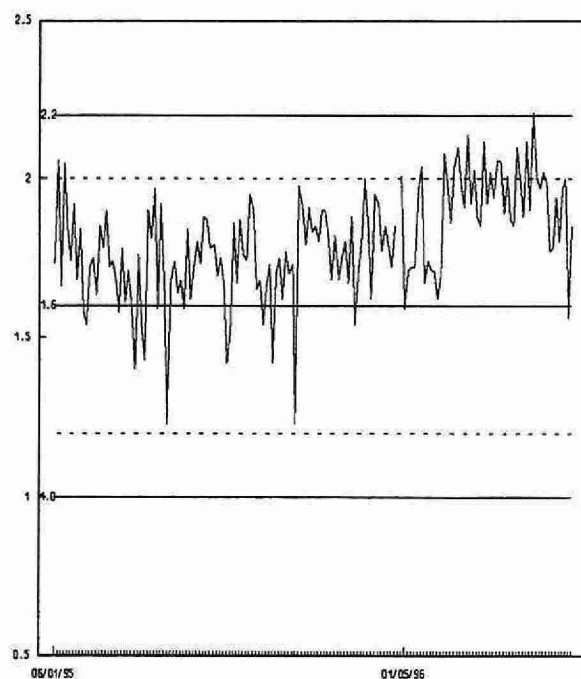
	n	Mean	Standard Deviation (1)
Long Term Blank	158	0.0626	0.9148
Filtered Blank	158	-0.0029	0.3048

CHLOROPHYLL "a", ACIDIFIED ($\mu\text{g/L}$)

QUALITY CONTROL DATA FROM 06/01/95 TO 12/11/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

CHLOROPHYLL "b"

QUALITY CONTROL DATA FROM 06/01/95 TO 11/12/96

Laboratory Unit: Colourimetry

Reporting Unit: µg/L

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	158	3.0	2.974	0.025	0.1400
B:	158	1.0	0.988	-0.012	0.1070
A+B:	158	4.0	3.962	-0.038	0.2229
A-B:	158	2.0	1.986	-0.014	0.1115

s.d.(AB)

S(between runs): 0.12

Sw(within run): 0.08

S/Sw: 1.6

The calibration is accepted if the calibration control values obtained lie within the ranges:

3.6 - 4.4 for A+B

1.7 - 2.3 for A-B

DUPLICATES:

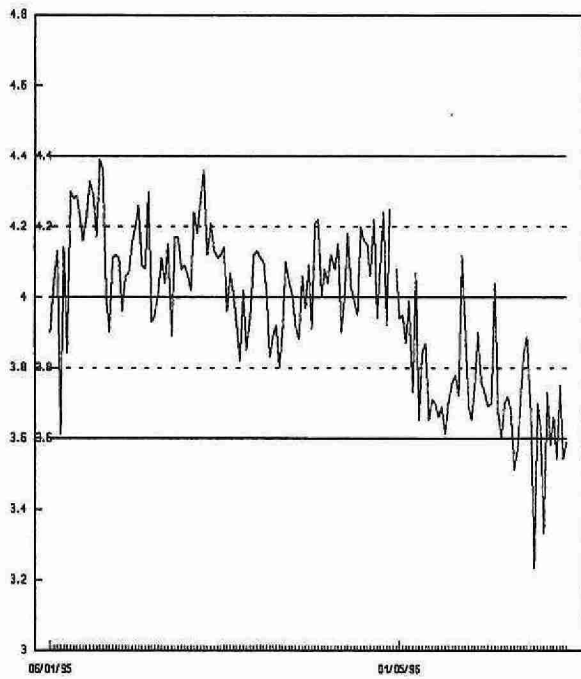
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
218	-0.25 - 1.0	0.1360	35.2
40	1.1 - 2.0	0.2327	16.9
18	2.1 - 5.0	0.5677	20.0
11	5.1 - 10.0	1.1345	12.8
16	10.1 - 60.0	2.6146	9.2
303	Overall	0.1935	

OTHER CHECKS:

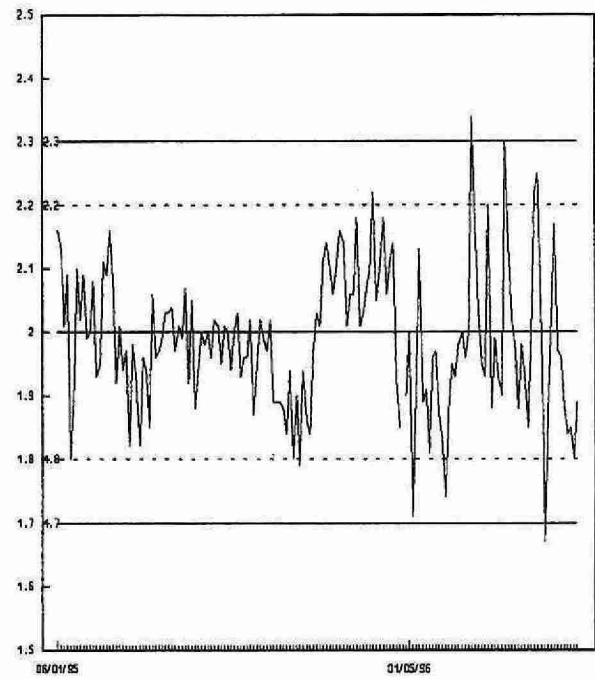
	n	Mean	Standard Deviation (1)
Long Term Blank	158	0.0750	0.0867
Filtered Blank	158	0.0733	0.0909

CHLOROPHYLL, "b" ($\mu\text{g/L}$)

QUALITY CONTROL DATA FROM 06/01/95 TO 12/11/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



Control Limit

Warning Limit

COLOUR, TRUE

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	15/10/80
Method Reference No.	E3025A	Units	TCU
LIMS Product Code	COL3025	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes		

SAMPLING:

Quantity Required:	25 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

True colour is measured on a settled sample colourimetrically in a system calibrated with acidified chloroplatinate standards. Colour is measured using a 400-450 nm broadband blue filter.
Approximate absorbance: 0.20 at the full scale level.

INSTRUMENTATION:

One colourimeter with broadband blue filter (400-450 nm)
One autosampler and chart-recorder
One Gilson pump

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

6 acidified chloroplatinate standards, 10, 20, 40, 60, 80, 100 TCU

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA, QCB, QCC
-------------	---

NOTES:

Slope factor is changed whenever light source in a colourimeter or cell is replaced. This is accomplished by analyzing 7 standards.

COLOUR, TRUE

QUALITY CONTROL DATA FROM 12/01/95 TO 18/12/96

Laboratory Unit: Dorset

Analytical Range: to 100 TCU

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	51	75	75.6	0.6	0.7974
B:	51	25	25.3	0.3	0.5972
C:	51	5	5.02	0.02	0.3766
A+B:	51	100	100.2	0.2	1.1898
A-B:	51	50	50.2	0.2	0.9590
B+C:	51	30	29.7	-0.3	0.7449
B-C:	51	20	20.3	0.3	0.5176

s.d.(AB) S(between runs): 0.70 Sw(within run): 0.68 S/Sw: 1.03

s.d.(BC) S(between runs): 0.50 Sw(within run): 0.37 S/Sw: 1.3

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

96.7	-	103.3	for	A+B
47.5	-	52.5	for	A-B
27.7	-	32.3	for	B+C
18.2	-	21.8	for	B-C

DUPLICATES:

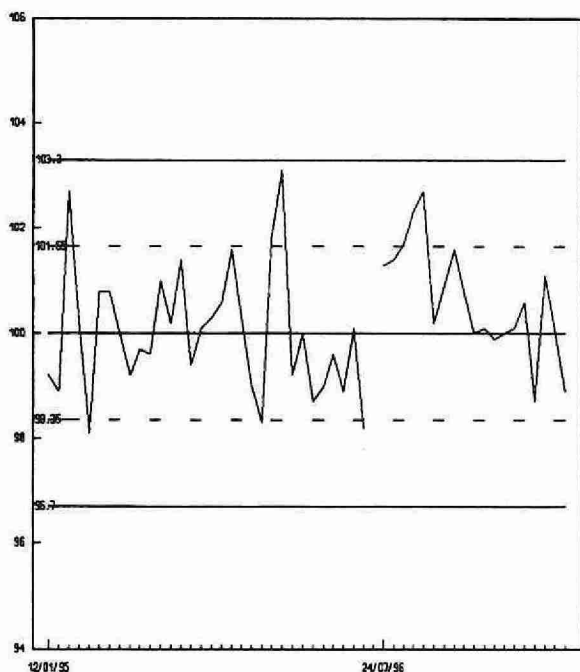
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
20	0.0 - 10.0	0.2879	5.7
26	10.1 - 20.0	0.2933	2.2
86	20.1 - 50.0	0.4548	5.3
33	50.1 - 100.0	0.4609	0.8
165	Overall	0.4049	

OTHER CHECKS:

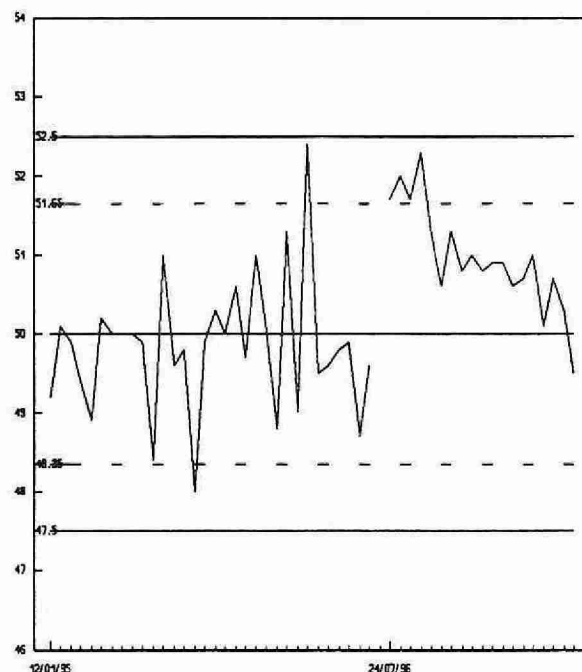
	n	Data Mean	Standard (1) Deviation
Long Term Blank	51	0.4372	0.3464

COLOUR, TRUE (TCU)

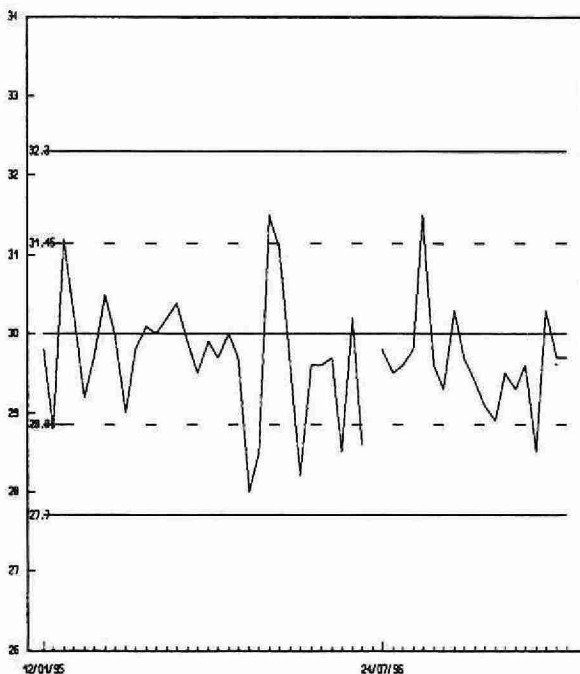
QUALITY CONTROL DATA FROM 12/01/95 TO 18/12/96



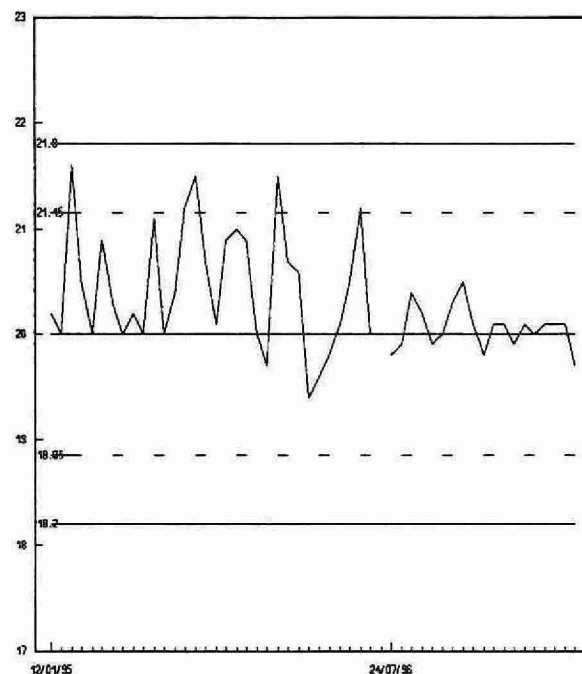
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

COLOUR, TRUE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	13/03/84
Method Reference No	E3219A	Units	TCU
LIMS Product Code	COL3219	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Effluents, Surface Waters, Industrial Wastes, Leachates		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

True colour is measured colourimetrically on the supernatant of a settled sample in a system calibrated with acidified chloroplatinate standards. The sample stream is measured using a broadband blue filter. Residual turbidity effects are suppressed by using a broadband red filter and increased path length in the reference stream.

Approximate absorbance: 0.3 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system. Colour measurement is through a 3.0 cm. light path using a broadband filter (400-450 nm). Turbidity measurement is through a 5.0 cm. light path using a different broadband filter (660-740 nm). Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

COLOUR, TRUE

QUALITY CONTROL DATA FROM 09/01/95 TO 24/12/96

Laboratory Unit: Colourimetry

Full Scale: to 100 TCU

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	70	70.0	70.6	0.6	0.6598
B:	70	25.0	25.04	0.04	0.3650
C:	70	7.50	7.87	0.37	0.3449
A+B:	70	95.0	95.7	0.7	0.8095
A-B:	70	45.0	45.6	0.6	0.6942
B+C:	70	32.5	32.9	0.4	0.5639
B-C:	70	17.5	17.2	-0.3	0.4317

s.d.(AB) S(between runs): 0.53

Sw(within run): 0.49

S/Sw: 1.1

s.d.(BC) S(between runs): 0.35

Sw(within run): 0.30

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

92.18	-	97.82	for	A+B
42.89	-	47.11	for	A-B
30.65	-	34.35	for	B+C
16.11	-	18.89	for	B-C

DUPLICATES:

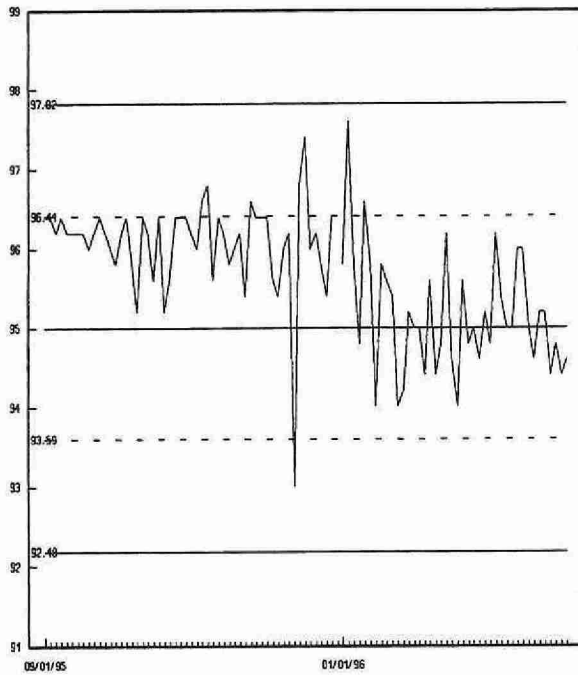
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
184	0.00 - 10.0	0.3968	17.1
52	10.1 - 20.0	0.6298	4.2
38	20.1 - 50.0	0.7316	2.6
10	50.1 - 100	1.1394	1.4.
284	Overall	0.5236	

OTHER CHECKS:

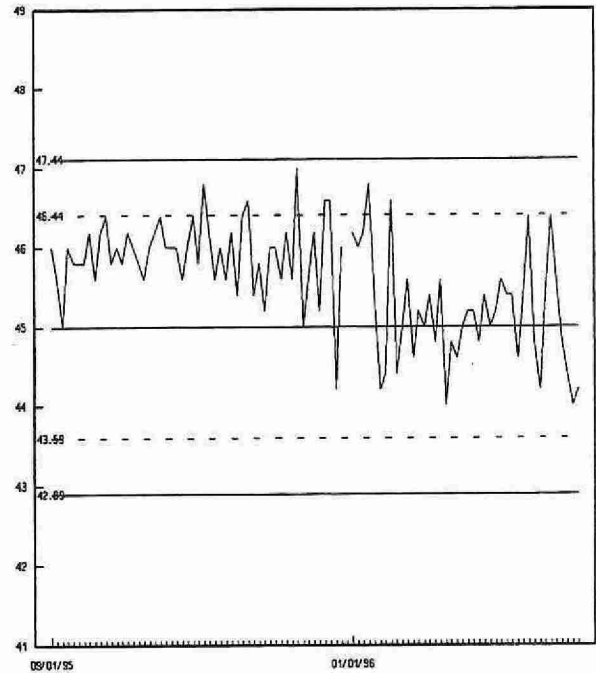
	n	Mean	Standard Deviation (1)
Long Term Blank	96	0.1646	0.7721

COLOUR, TRUE (TCU)

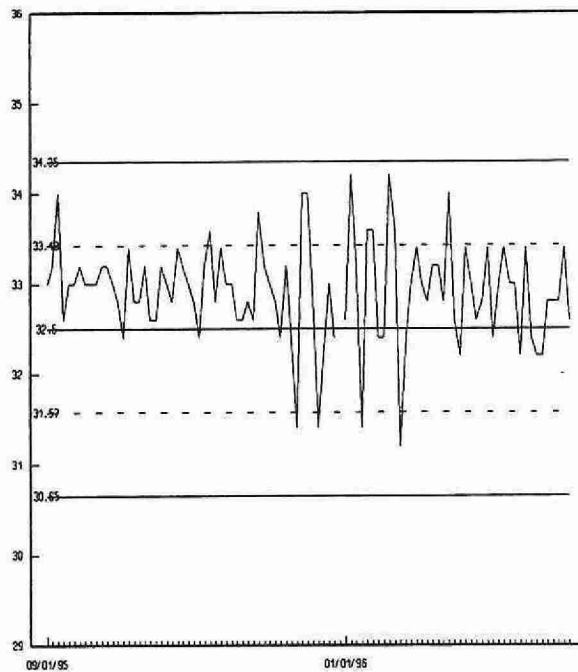
QUALITY CONTROL DATA FROM 09/01/95 TO 24/12/96



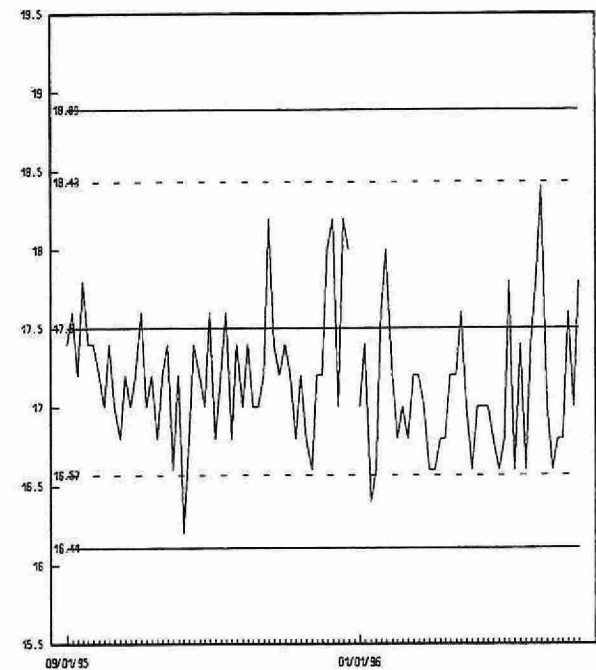
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

———— Control Limit
 ----- Warning Limit

CONDUCTIVITY

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/06/76
Method Reference No.	E3024B	Units	$\mu\text{S}/\text{cm}$ at 25°C
LIMS Product Code	COND3024	Supervisor	J. McBride
Sample Type/Matrix	Streams, Lakes, Precipitation, Soil Leachates		

SAMPLING:

Quantity Required	75 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

The sample is introduced into a jacketed conductivity cell. The conductivity is calculated from the chart record.

INSTRUMENTATION:

Conductivity meter with cell enclosed in a water jacket; temperature controlled water circulator. One autosampler, Gilson pump and dual-range chart recorder.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

5 KCl standards, 10.2, 30.6, 50.8, 101.1, 151 μS

CONTROLS:

Calibration	LTBL plus 4 standards, e.g. QCA
-------------	---------------------------------

NOTES:

The control standards are corrected for the LTB from which they are made.

CONDUCTIVITY

QUALITY CONTROL DATA FROM 12/01/95 TO 19/12/96

Laboratory Unit: Dorset

Analytical Range: to 500 $\mu\text{S/cm}$

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	53	146.7	147.1	0.4	0.7048
B:	53	51.8	52.4	0.6	0.7429
C:	53	51.8	52.4	0.6	0.6347
D:	53	14.9	15.3	0.4	0.3827
A+B:	53	198.5	198.9	0.4	1.0406
A-B:	53	94.9	94.7	-0.2	0.8490
C+D:	53	66.7	67.0	0.3	0.7184
C-D:	53	36.9	37.0	0.1	0.5464

s.d.(AB)	S(between runs):	0.72	Sw(within run):	0.60	S/Sw: 1.2
s.d.(CD)	S(between runs):	0.52	Sw(within run):	0.39	S/Sw: 1.4

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

195	-	202	for	A+B
92.2	-	97.6	for	A-B
64.9	-	68.5	for	C+D
35.6	-	38.2	for	C-D

DUPLICATES:

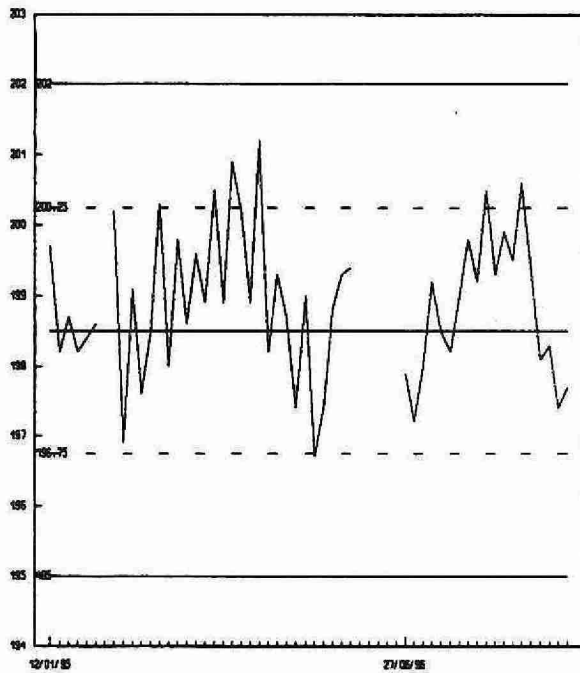
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
163	0.00 - 50.0	0.4328	2.7
7	50.1 - 100.0	0.9302	1.6
3	100.1 - 250.0	0.8165	0.5
2	250.1 - 500.0	N.A.	N.A.
175	Overall	0.4708	

OTHER CHECKS:

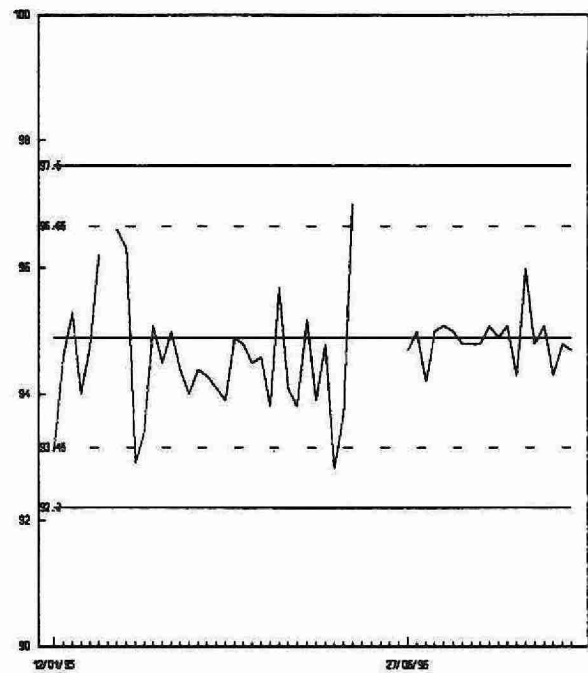
	n	Mean	Standard Deviation (1)
Long Term Blank	57	0.5256	0.3387

CONDUCTIVITY ($\mu\text{S}/\text{cm}$)

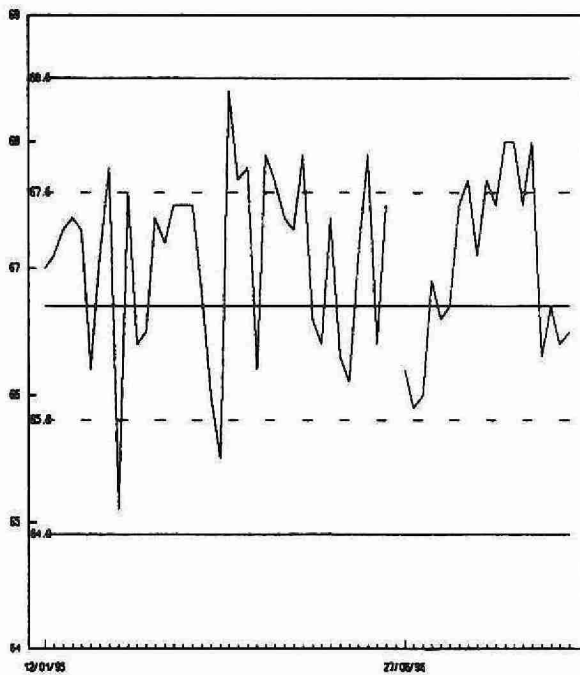
QUALITY CONTROL DATA FROM 12/01/95 TO 19/12/96



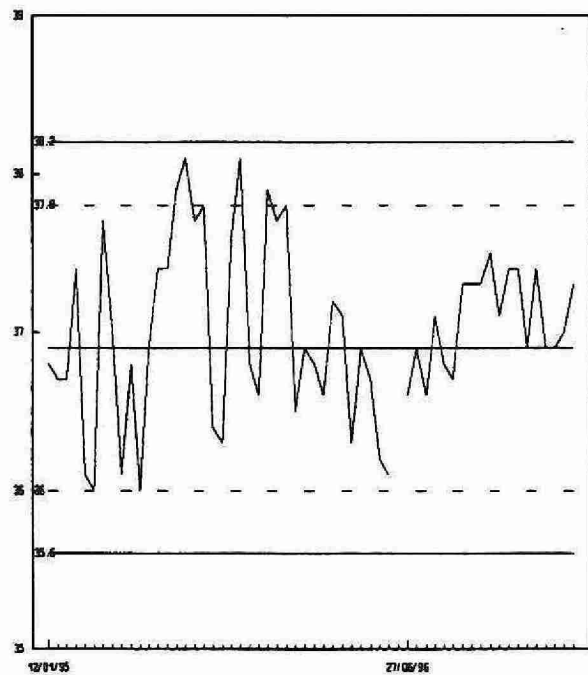
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

———— Control Limit
 - - - - - Warning Limit

CONDUCTIVITY

IDENTIFICATION:

Laboratory Unit:	Ion Chromatography	Method Introduced:	01/04/78
Method Reference No:	E3177A	Units:	$\mu\text{S/cm}$ at 25°C
LIMS Product Code:	COND3177	Supervisor:	J. McBride
Sample Type/Matrix:	Precipitation, Throughfall, Stemflow		

SAMPLING:

Quantity Required:	15 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

After equilibration at 25°C, The conductivity of the sample is measured.

INSTRUMENTATION:

Automated modular continuous flow conductivity system comprised of sampler, water bath, conductivity meter with cell, chart recorder.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

1 standard

CONTROLS:

Calibration:	LTBL plus 2 standards, e.g. QCA
Drift:	1 solution every 10 samples

NOTES:

A calibration standard for the ion chromatographic system is used to monitor the drift for the conductivity system, but its theoretical conductivity is unknown.

CONDUCTIVITY

QUALITY CONTROL DATA FROM 12/01/95 TO 23/01/96

Laboratory Unit: Ion Chromatography

Full Scale: to 100.0 $\mu\text{S}/\text{cm}$

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	23	44.5	45.3	1.2	0.9741
B:	23	7.5	8.4	0.9	0.2989
A+B:	23	52.0	53.6	1.6	1.0464
A-B:	23	37.0	36.9	-0.1	0.9906

s.d.(AB) S(between runs): 0.72 Sw(within run): 0.70 S/Sw: 1.02

The calibration is accepted if the calibration control values obtained lie within the ranges:

47.76 - 56.24 for A+B
33.82 - 40.18 for A-B

DUPLICATES:

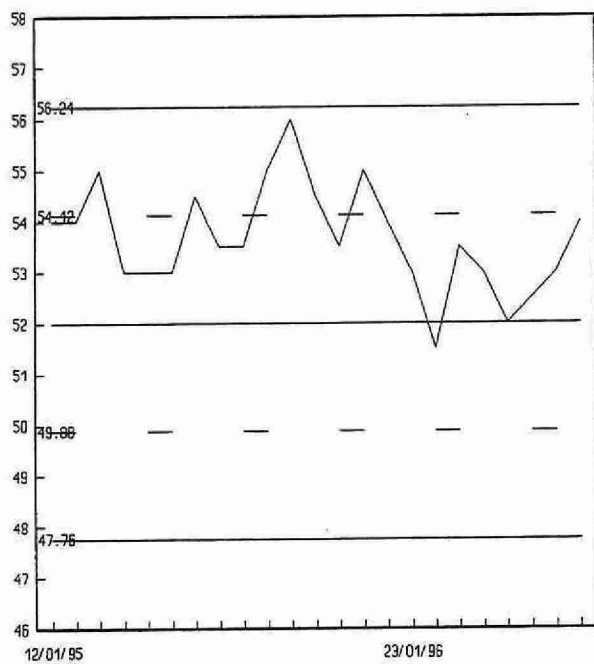
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
25	0.0 - 20.0	0.6284	5.0
19	20.1 - 50.0	0.6939	1.9
1	50.1 - 100.0	N.A.	N.A.
45	Overall	0.4995	

OTHER CHECKS:

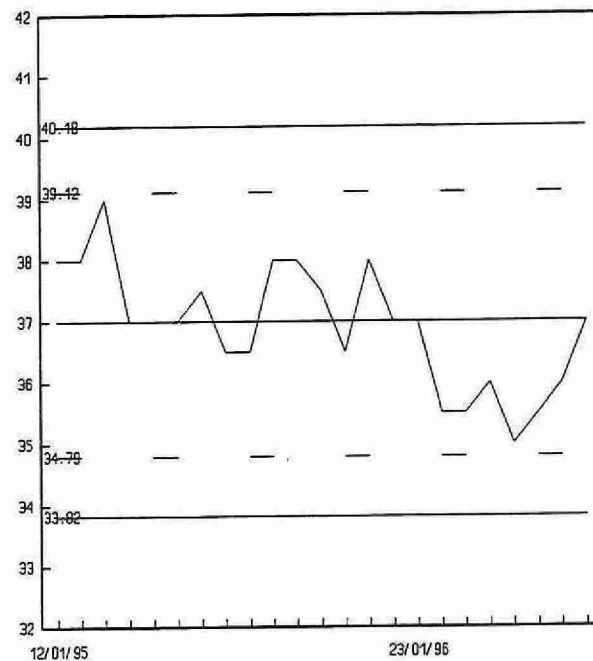
	n	Mean	Standard Deviation (1)
Long Term Blank	23	1.1522	0.3157

CONDUCTIVITY ($\mu\text{S}/\text{cm}$)

QUALITY CONTROL DATA FROM 12/01/95 TO 27/11/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

— Control Limit
 --- Warning Limit

CONDUCTIVITY

IDENTIFICATION:

Laboratory Unit:	Titration	Method Introduced:	01/04/74
Method Reference No:	E3218A	Units:	$\mu\text{S/cm}$ at 25°C
LIMS Product Code:	PHALCO3218, CONDPH3218	Supervisor:	J. McBride
Sample Type/Matrix:	Domestic Waters, Sewage, Industrial effluents		

SAMPLING:

Quantity Required:	25 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

After equilibration at 25°C, the conductivity of the sample is measured. pH, and total fixed endpoint alkalinity are determined simultaneously.

INSTRUMENTATION:

Automated modular continual flow conductivity system comprising of a sampler, water bath, pump, conductivity meter with cell plus microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
--------------------------------	--------------------	--------------------

CONTROLS:

Calibration:	LTBL plus 3 standards, e.g. QCA
Drift:	In run standards throughout the run (tap water diluted to 50% V/V)

CONDUCTIVITY

QUALITY CONTROL DATA FROM 05/01/95 TO 23/12/96

Laboratory Unit: Titration

Analytical Range: to 2000 $\mu\text{S}/\text{cm}$

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	195	1413.0	1410.9	-2.1	5.2924
B:	195	717.8	716.0	-1.8	2.8700
C:	195	717.8	716.0	-1.8	2.8619
D:	195	147.0	148.3	1.3	1.3660
A+B:	195	2130.8	2126.9	-3.9	6.6549
A-B:	195	695.2	694.9	-0.3	5.3108
C+D:	195	864.8	864.3	-0.5	3.0670
C-D:	195	570.8	567.7	-3.1	3.2720

s.d.(AB) S(between runs): 4.26 Sw(within run): 3.76 S/Sw: 1.1

s.d.(CD) S(between runs): 2.24 Sw(within run): 2.31 S/Sw: 0.97

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

2108.8	-	2152.8	for	A+B
678.7	-	711.7	for	A-B
852.96	-	876.64	for	C+D
561.92	-	579.68	for	C-D

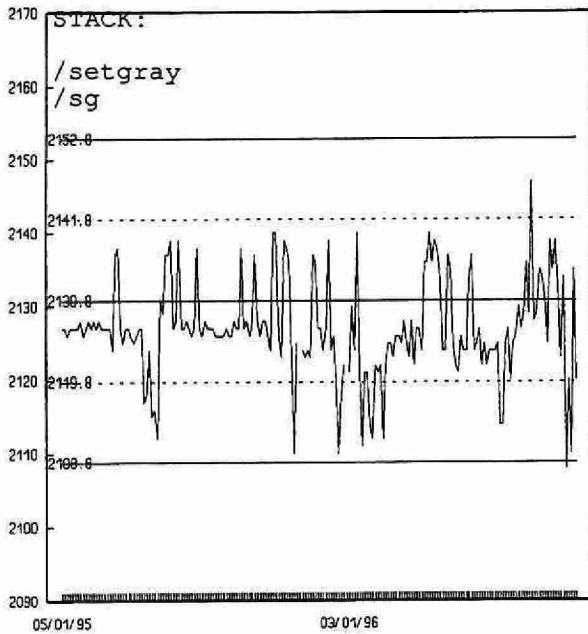
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
176	0 - 400	1.1366	0.5
186	401 - 1000	2.8194	2.3
63	1001 - 2000	4.6963	0.5
27	2001 - 10000	9.1274	0.2
452	Overall	2.2641	

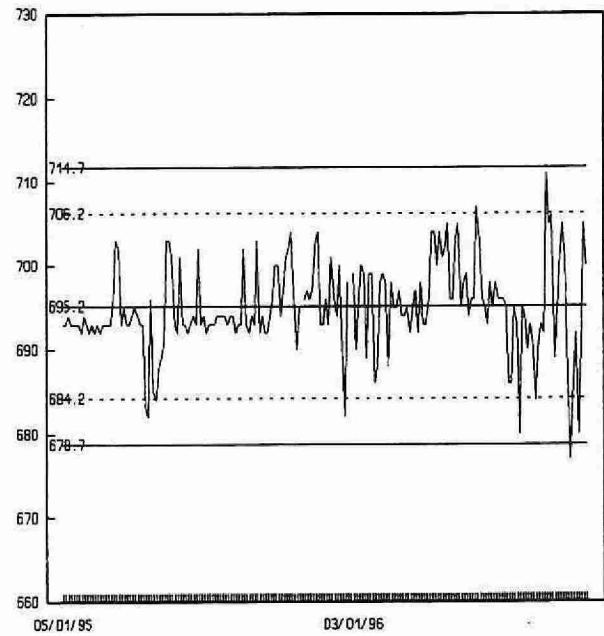
CONDUCTIVITY ($\mu\text{S}/\text{cm}$)

QUALITY CONTROL DATA FROM 05/01/95 TO 23/12/96

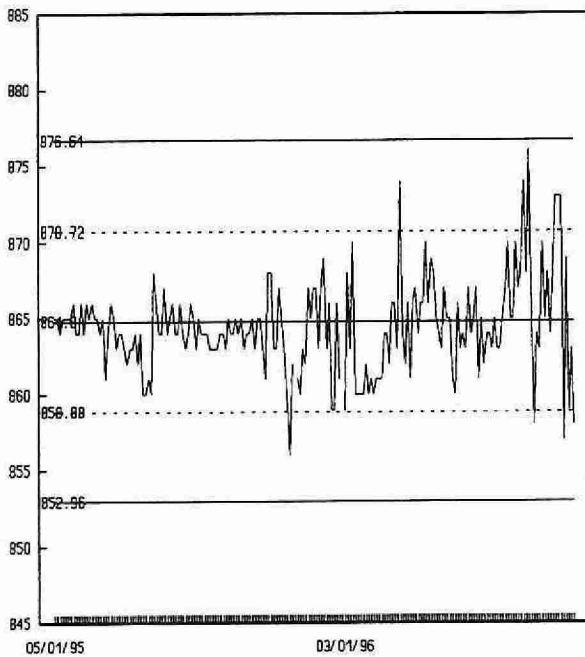
ERROR: undefined
OFFENDING COMMAND: ld?



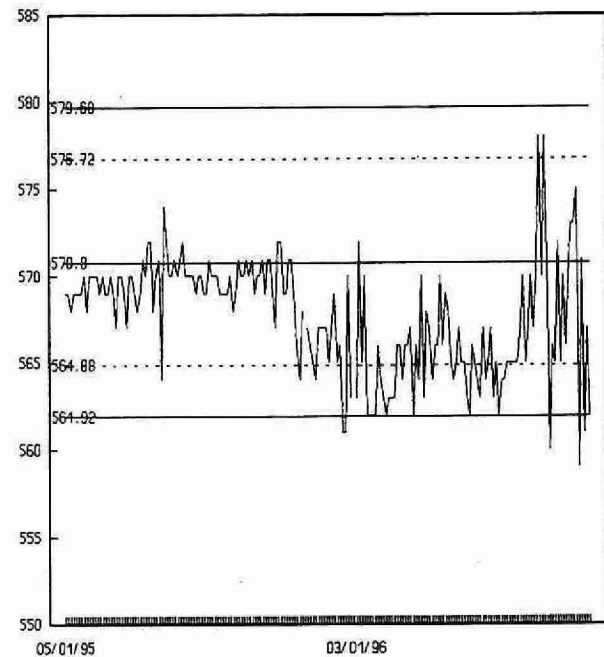
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

———— Control Limit
----- Warning Limit

CONDUCTIVITY

IDENTIFICATION:

Laboratory Unit:	Titration	Method Introduced:	01/04/74
Method Reference No:	E3289A	Units:	$\mu\text{S/cm}$ at 25°C
LIMS Product Code:	PHALCO3289, CONDPH3289	Supervisor:	J. McBride
Sample Type/Matrix:	Rivers, Lakes		

SAMPLING:

Quantity Required:	25 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

After equilibration at 25°C, the conductivity of the sample is measured. pH, and total fixed endpoint alkalinity are determined simultaneously.

INSTRUMENTATION:

Automated modular continual flow conductivity system comprising of a sampler, water bath, pump, conductivity meter with cell plus microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
--------------------------------	--------------------	--------------------

CONTROLS:

Calibration:	BL plus 3 standards, e.g. QCA
Drift:	In run standards throughout the run (tap water diluted to 20% V/V)

CONDUCTIVITY

QUALITY CONTROL DATA FROM 03/01/95 TO 24/12/96

Laboratory Unit: Titration

Analytical Range: to 2000 $\mu\text{S/cm}$

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	154	717.8	717.4	-0.4	1.4362
B:	154	147.0	147.7	0.7	0.8456
C:	154	147.0	147.7	0.7	0.8456
D:	154	37.1	37.4	0.3	0.9048
A+B:	154	864.8	865.0	0.2	1.7522
A-B:	154	570.8	569.7	-1.1	1.5763
C+D:	154	184.1	185.0	0.9	1.4277
C-D:	154	109.9	110.3	0.4	1.0145

s.d.(AB) S(between runs): 1.18 Sw(within run): 1.11 S/Sw: 1.1

s.d.(CD) S(between runs): 0.88 Sw(within run): 0.71 S/Sw: 1.2

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

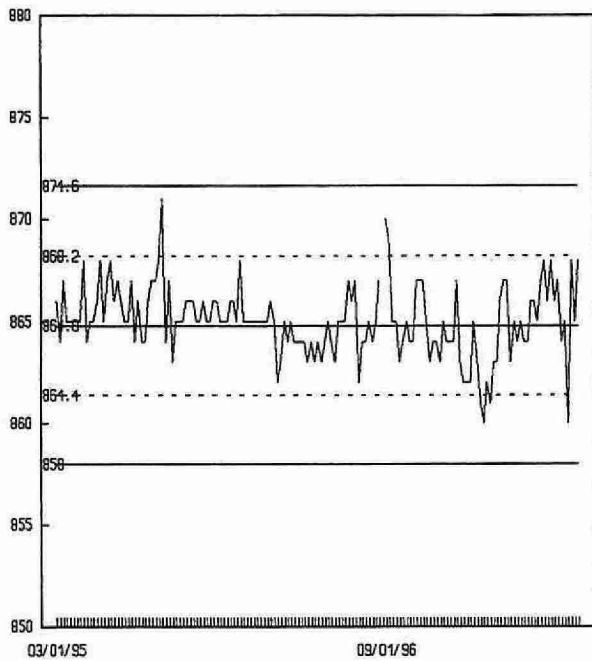
858	-	871.6	for	A+B
565.7	-	575.9	for	A-B
180.54	-	187.66	for	C+D
107.23	-	112.57	for	C-D

DUPLICATES:

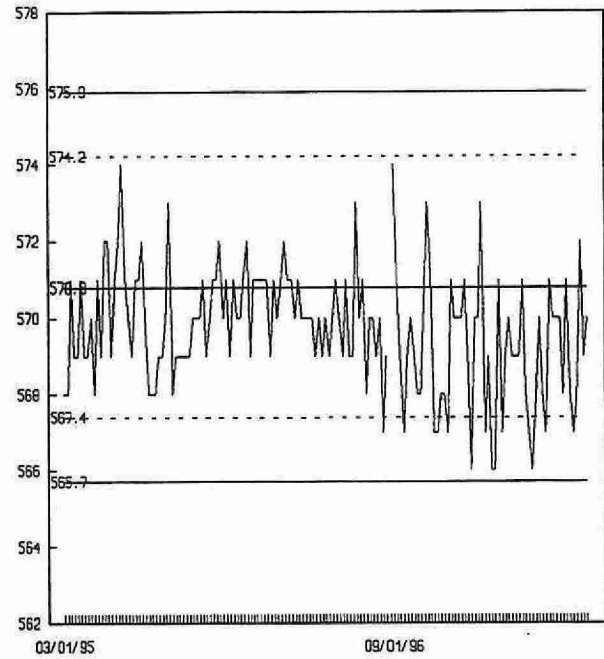
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
213	0 - 400	1.5645	0.7
164	401 - 1000	2.5564	0.5
23	1001 - 2000	7.6470	0.5
6	2001 - 10000	40.614	1.3
406	Overall	2.1667	

CONDUCTIVITY ($\mu\text{S}/\text{cm}$)

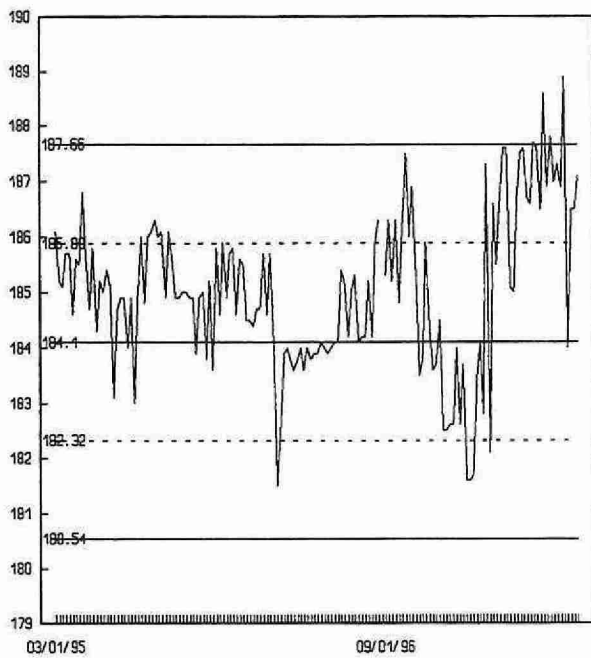
QUALITY CONTROL DATA FROM 03/01/95 TO 24/12/96



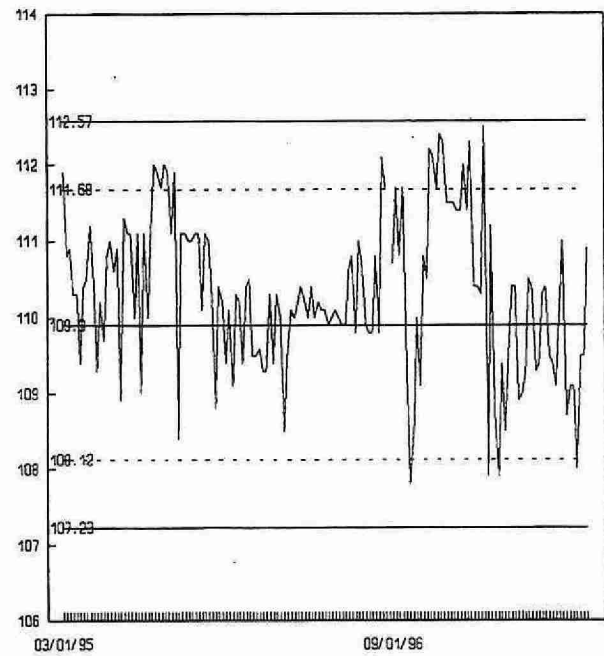
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

———— Control Limit
 ----- Warning Limit

CYANIDE, FREE

IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	
Method Reference No:	E3014A	Units:	mg/L as CN ⁻
LIMS Product Code:	CN3014	Supervisor:	J. McBride
Sample Type/Matrix:	Surface and drinking water, sewages and industrial wastes and in distillates from the manual distillation of samples for total cyanides.		

SAMPLING:

Quantity Required:	350 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

Prescreen is conducted on all samples requiring Total Cyanide. If results of the prescreen are less than 0.01 mg/L CN⁻ no further processing is required, otherwise the size of sample taken is judged upon the prescreen result. Free cyanide, includes the free, simple and weakly bound complex cyanides that decompose at 106°C, at pH 4. Cyanide is determined colourimetrically by the reaction of cyanide with chloramine-T to form cyanogen chloride which reacts with a combination of barbituric acid and isonicotinic acid to form a highly coloured coupling product which is measured at 600 nm.

INSTRUMENTATION:

Distillation bath at 106°C.

Basic automated modular continuous flow system with colourimetric measurement through a 5 cm light path at 600 nm.
Data capture, reduction, and processing via a multistage microcomputer system.

REPORTING:

Maximum Significant Figures: 2 or the nearest W	Current W value: 0.001	Current T value: 0.005
---	------------------------	------------------------

CALIBRATION:

BL plus 1 standard

CONTROLS:

Calibration:	2 standards, e.g. QCA
Drift:	Blank and check standards

CYANIDE, FREE

QUALITY CONTROL DATA FROM 24/01/95 TO 18/12/96

Laboratory Unit: Colourimetry

Full Scale: to 0.2 mg/L as CN

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	141	0.15	0.1469	-0.0031	0.0041
B:	141	0.02	0.0193	-0.0007	0.0011
A+B:	141	0.17	0.1662	-0.0038	0.0046
A-B:	141	0.13	0.1275	-0.0025	0.0040

s.d.(AB)

S(between runs): 0.0030

Sw(within run): 0.0028

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

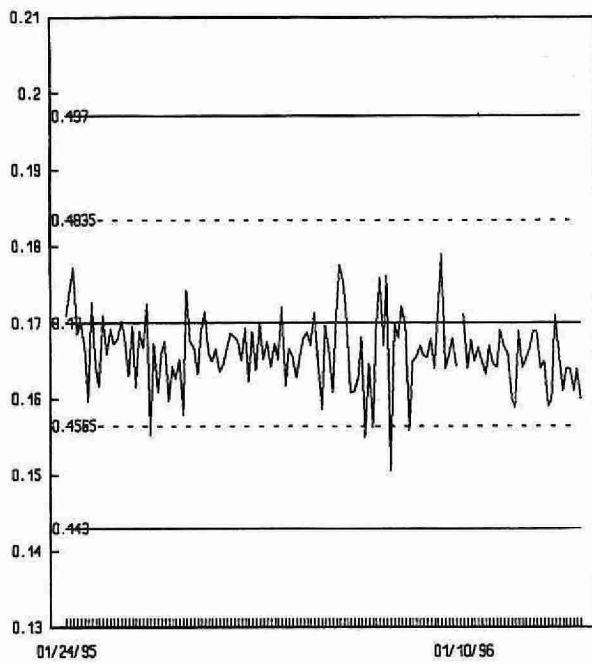
0.143 - 0.197 for A+B
0.111 - 0.149 for A-B

DUPLICATES:

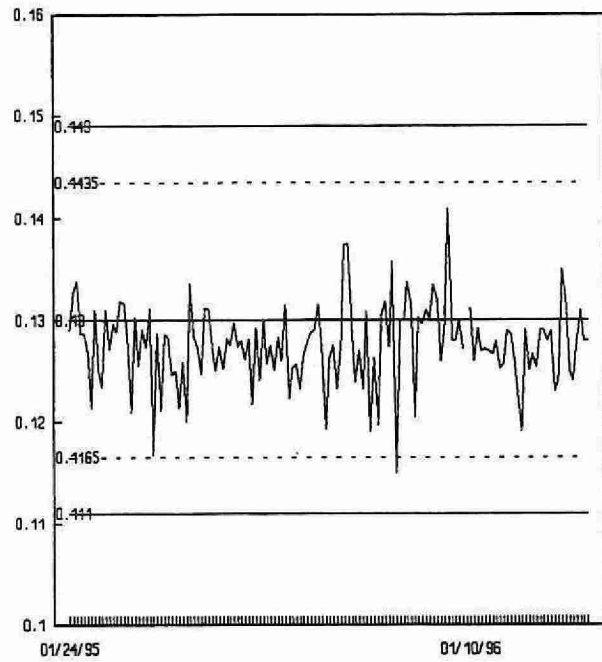
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
213	0 - 0.020	0.0002	9.0
2	0.021 - 0.040	N.A.	N.A.
9	0.041 - 0.100	0.0017	2.2
4	0.101 - 0.200	0.0029	2.0
228	Overall	0.0005	

CYANIDE, FREE (mg/L as CN)

QUALITY CONTROL DATA FROM 24/01/95 TO 18/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

CYANIDE, TOTAL

IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	
Method Reference No:	E3015A	Units:	mg/L as CN ⁻
LIMS Product Code:	CN3015	Supervisor:	J. McBride
Sample Type/Matrix:	Surface and drinking water, sewage, landfill leachates, and industrial wastes.		

SAMPLING:

Quantity Required:	350 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

Prescreen is conducted on all samples requiring Total Cyanide through the automated distillation procedure. Total Cyanides, including free, simple and complex cyanides are distilled out of a tartaric acid reflux/distillation as HCN and trapped in an alkaline solution. Cyanide is determined colourimetrically by the reaction of cyanide with chloramine-T to form cyanogen chloride which reacts with a combination of barbituric acid and isonicotinic acid to form a highly coloured coupling product which is measured at 600 nm.

INSTRUMENTATION:

Distillation bath.

Basic automated modular continuous flow system with colourimetric measurement through a 5 cm light path at 600 nm.
Data capture, reduction, and processing via a multistage microcomputer system.

REPORTING:

Maximum Significant Figures: 2 or the nearest W	Current W value: 0.001	Current T value: 0.005
---	------------------------	------------------------

CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration:	2 standards, e.g. QCA
Drift:	BL and check standards

CYANIDE, TOTAL

QUALITY CONTROL DATA FROM 24/01/95 TO 18/12/96

Laboratory Unit: Colourimetry

Full Scale: to 0.2 mg/L as CN

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	141	0.15	0.1469	-0.0031	0.0041
B:	141	0.02	0.0193	-0.0007	0.0011
A+B:	141	0.17	0.1662	-0.0038	0.0046
A-B:	141	0.13	0.1275	-0.0025	0.0040

s.d.(AB)

S(between runs): 0.0030

Sw(within run): 0.0028

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

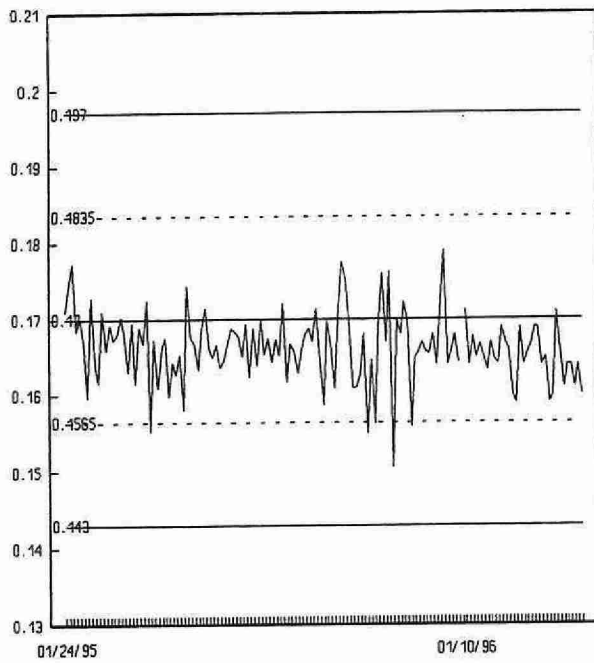
0.143 - 0.197 for A+B
0.111 - 0.149 for A-B

DUPLICATES:

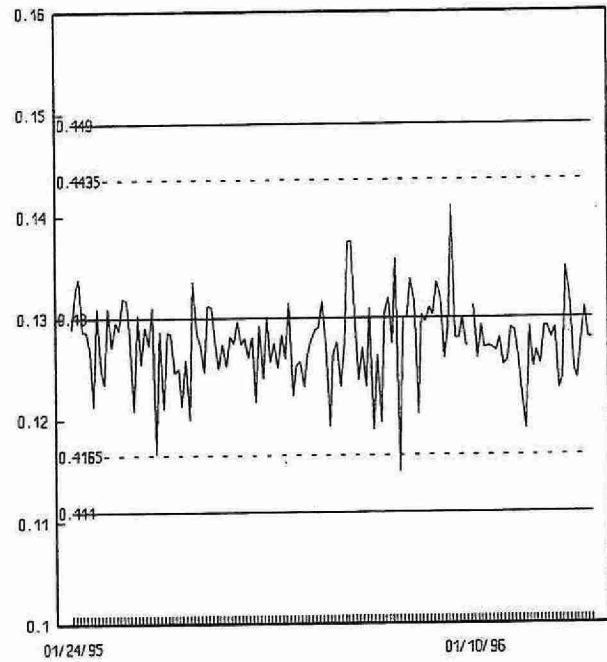
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
186	0 - 0.020	0.00035	20.2
1	0.021 - 0.040	N.A.	N.A.
6	0.041 - 0.100	0.0011	1.2
4	0.101 - 0.200	0.0029	1.2
197	Overall	0.0005	

CYANIDE, TOTAL (mg/L as CN)

QUALITY CONTROL DATA FROM 24/01/95 TO 18/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

FLUORIDE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	before '74
Method Reference No	E3369A	Units	mg/L as F
LIMS Product Code	FNOT3369	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Surface Waters, Leachates, Effluents		

SAMPLING:

Quantity Required	50 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Using an automated flow system the sample is distilled in the presence of sulphuric acid at 160°C; the distillate is then reacted (in an acetic acid-acetate buffer media) with Alizarin Fluorine Blue and lanthanum nitrate to form a ternary Alizarin Blue-lanthanide-fluoride complex.

Approximate absorbance: 0.8 at the full scale level.

INSTRUMENTATION:

Modular continuous flow colourimetric system plus a distillation module. Colourimetric measurement is through a 5.0 cm. light path at 630 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration	LTB plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

FLUORIDE

QUALITY CONTROL DATA FROM 04/01/95 TO 20/12/96

Laboratory Unit: Colourimetry

Analytical Range: to 2.0 mg/L as F

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	130	1.6	1.603	0.003	0.0185
B:	130	0.8	0.797	-0.003	0.0124
C:	130	0.16	0.162	0.002	0.0111
A+B:	130	2.4	2.400	0.000	0.0229
A-B:	130	0.8	0.805	0.005	0.0217
B+C:	130	0.96	0.963	0.003	0.0187
B-C:	130	0.64	0.632	-0.008	0.0144

s.d.(AB) S(between runs): 0.0002 Sw(within run): 0.0002 S/Sw: 1.0

s.d.(BC) S(between runs): 0.00014 Sw(within run): 0.00010 S/Sw: 1.3

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

2.302	-	2.498	for	A+B
0.726	-	0.874	for	A-B
0.91	-	1.01	for	B+C
0.59	-	0.69	for	B-C

DUPLICATES:

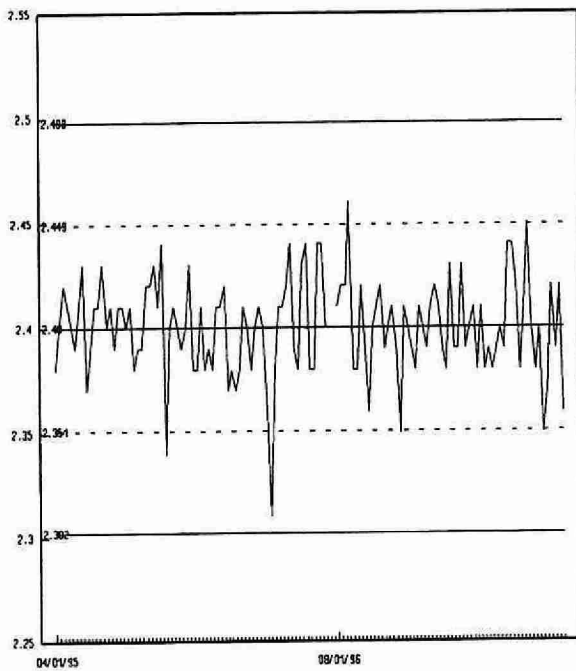
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
255	0.00 - 0.20	0.0092	11.4
27	0.21 - 0.40	0.0136	11.2
59	0.41 - 1.00	0.0172	2.3
35	1.01 - 2.00	0.0250	1.9
376	Overall	0.0118	

OTHER CHECKS:

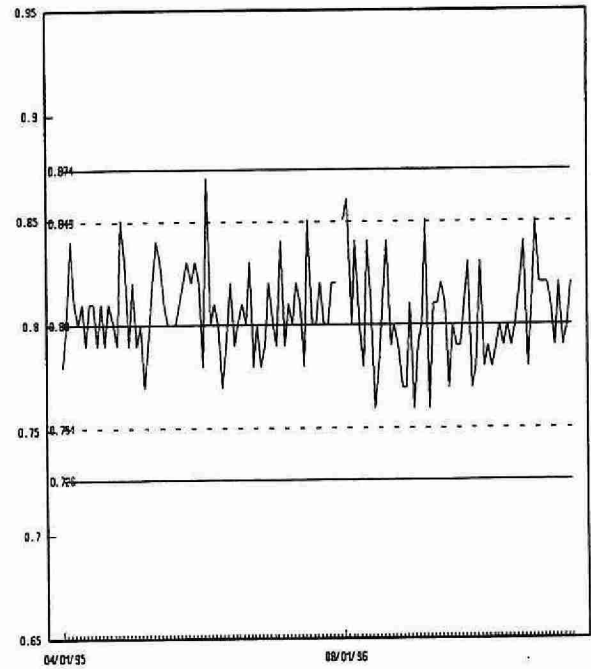
	n	Data Mean	Standard (1) Deviation
Long Term Blank	121	-0.00066	0.0096

FLUORIDE (mg/L as F)

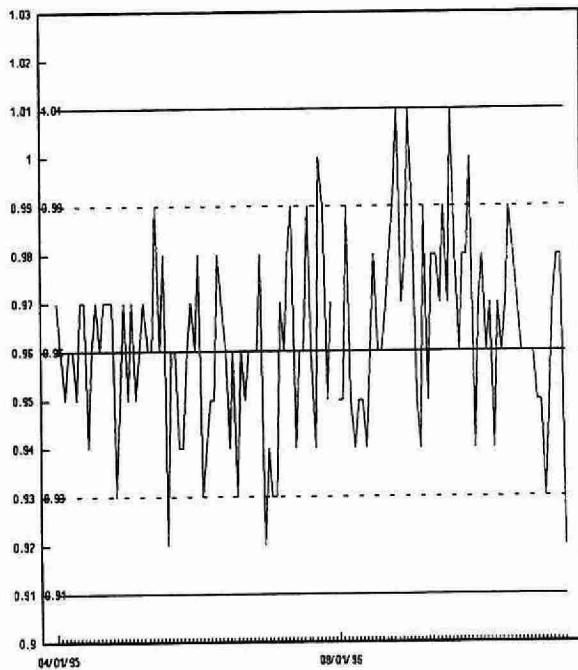
QUALITY CONTROL DATA FROM 04/01/95 TO 20/12/96



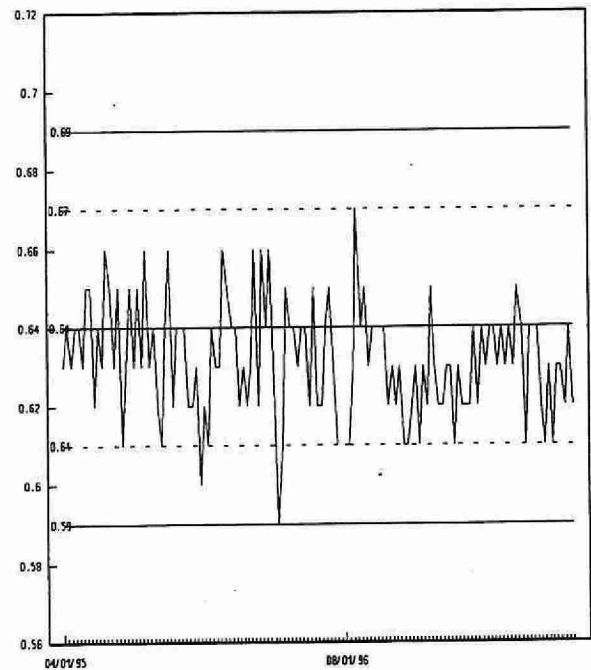
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

———— Control Limit
 ----- Warning Limit

HARDNESS

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as CaCO ₃
LIMS Product Code	CAT3171,HARD3171	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Soil Extracts		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analysed for calcium and magnesium by AAS (E3171A). Hardness is calculated using the formula:

$$HARDT (CAUR \times 2.497) (MGUR \times 4.118)$$

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

Refer to Calcium and Magnesium tests (E3171A)

CONTROLS:

Refer to Calcium and Magnesium tests (E3171A)

HARDNESS

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as CaCO ₃
LIMS Product Code	CAT3217,CATS3217,HARD3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage, Industrial Wastes		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analysed for calcium and magnesium by AAS (E3217A). Hardness is calculated using the formula:

$$HARDT (CAUR \times 2.497) (MGUR \times 4.118)$$

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
--------------------------------	----------------------	----------------------

CALIBRATION:

Refer to Calcium and Magnesium tests (E3217A)

CONTROLS:

Refer to Calcium and Magnesium tests (E3217A)

HARDNESS

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as CaCO ₃
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analysed for calcium and magnesium by AAS (E3249A). Hardness is calculated using the formula:

$$HARDT \ (CAUR \times 2.497) \ (MGUR \times 4.118)$$

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

Refer to Calcium and Magnesium tests (E3249A)

CONTROLS:

Refer to Calcium and Magnesium tests (E3249A)

IRON, TOTAL

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3303B	Units	µg/L as Fe
LIMS Product Code	FEMN3303, FE3303	Supervisor	J. McBride
Sample Type/Matrix	Surface water, precipitation, soil leachates		

SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic, capped, acidified to 0.25% with HNO ₃

ANALYTICAL PROCEDURE:

An undigested sample is introduced to an in-line UV digester. A reducing agent and a buffer are added to the sample. TPTZ is added to develop a blue colour, the intensity of which is proportional to the concentration of Fe in the sample. The colour is measured at 600nm.

INSTRUMENTATION:

- An AAII autoanalyzer with colorimeter and automated sampler.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
--------------------------------	--------------------	---------------------

CALIBRATION:

BL plus 4 standards

CONTROLS:

Calibration	Long Term blank, 3 QC's, 4 duplicates
Drift	Blank plus 1 standard every 10 samples.

IRON, TOTAL

QUALITY CONTROL DATA FROM 05/01/95 TO 15/12/96

Laboratory Unit: Dorset

Full Scale: to 1000.0 µg/L as Fe

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	71	750.0	750.2	0.2	6.2464
B:	71	250.0	248.2	-1.8	3.8921
C:	71	50.0	48.1	-1.9	2.3148
A+B:	71	1000.0	999.2	-0.8	7.4705
A-B:	71	500.0	502.0	2.0	7.2683
B+C:	71	300.0	297.1	-2.9	4.8525
B-C:	71	200.0	200.1	0.1	3.9244

s.d.(AB)	S(between runs):	5.20	Sw(within run):	5.14	S/Sw: 1.01
s.d.(BC)	S(between runs):	3.17	Sw(within run):	2.79	S/Sw: 1.13

The calibration is accepted if the calibration control values obtained lie within the ranges:

975	-	1025	for	A+B
480	-	520	for	A-B
285	-	315	for	B+C
190	-	210	for	B-C

DUPLICATES:

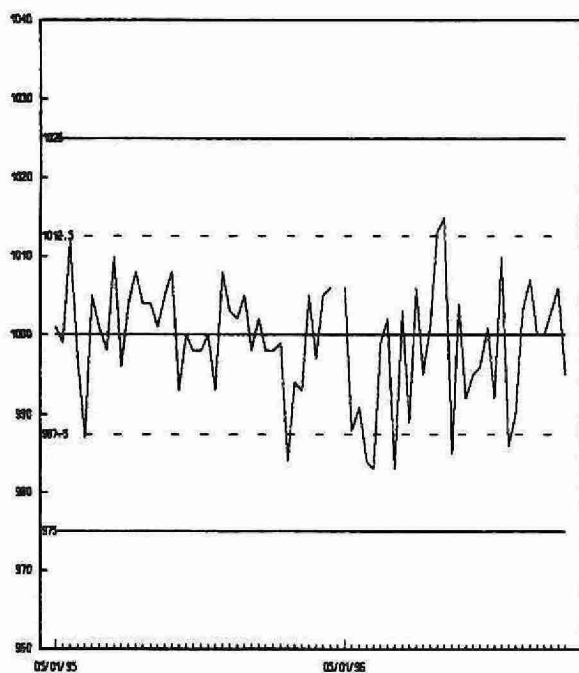
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
110	0 - 100	1.9077	5.6
54	101 - 200	2.3467	1.6
51	201 - 500	3.7771	1.1
19	501 - 1000	5.9878	0.8
234	Overall	2.6522	

OTHER CHECKS:

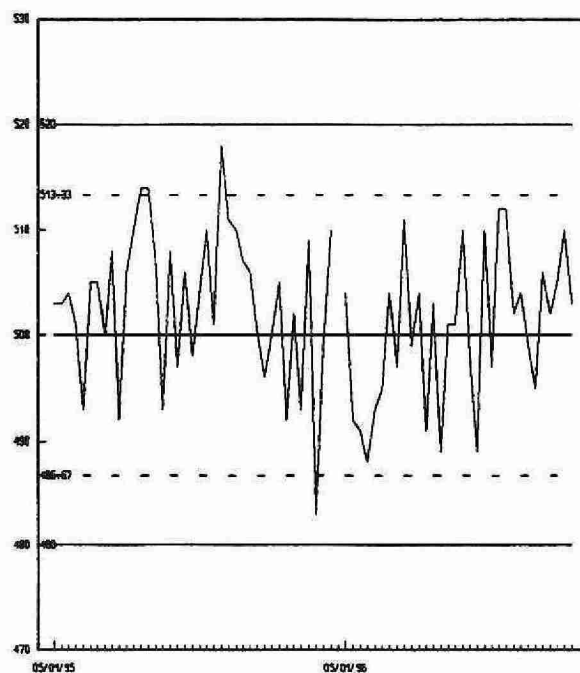
	n	Mean	Standard Deviation (1)
Long Term Blank	71	0.2394	1.6077

IRON, TOTAL ($\mu\text{g/L}$ as Fe)

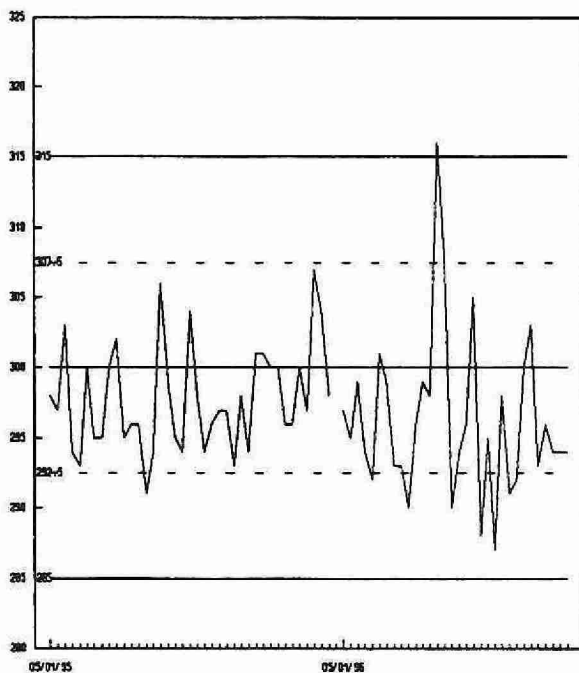
QUALITY CONTROL DATA FROM 05/01/95 TO 15/12/96



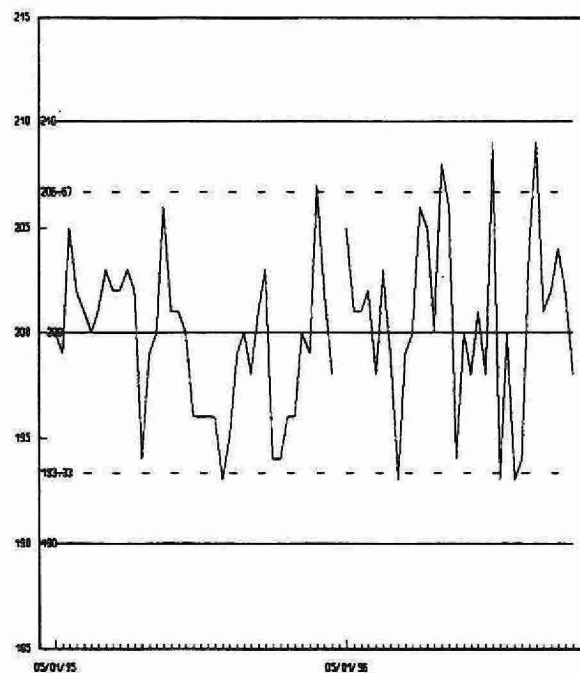
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

LITHIUM

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/06/96
Method Reference No.	E3392A	Units	µg/L as Li
LIMS Product Code	LI3392	Supervisor	J. McBride
Sample Type/Matrix	Surface waters, groundwaters, precipitation and industrial waste.		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 670.8 nm with an air-acetylene flame. Potassium chloride is added as a suppressant via an automated sampling train.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
--------------------------------	--------------------	--------------------

CALIBRATION:

BL plus 13 standards

CONTROLS:

Calibration	LTBL plus 4 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

LITHIUM

QUALITY CONTROL DATA FROM 01/01/96 TO 31/12/96

Laboratory Unit: Dorset

Analytical Range: to 1000 µg/L as Li

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	16	803.2	802	-1.2	8.1094
B:	16	401.6	401	-0.6	2.8925
C:	16	200.8	201	0.2	1.7935
D:	16	50.2	50.4	0.2	0.9811
A+B:	16	1204.8	1203	-1.8	9.1394
A-B:	16	401.6	401	-0.6	8.0454
C+D:	16	251.0	252	1	2.5091
C-D:	16	150.6	151	0.4	1.4361

s.d.(AB)	S(between runs):	6.09	Sw(within run):	5.69	S/Sw: 1.07
s.d.(CD)	S(between runs):	1.44	Sw(within run):	1.01	S/Sw: 1.42

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

1169	-	1241	for	A+B
375	-	429	for	A-B
241	-	261	for	C+D
144	-	158	for	C-D

DUPLICATES:

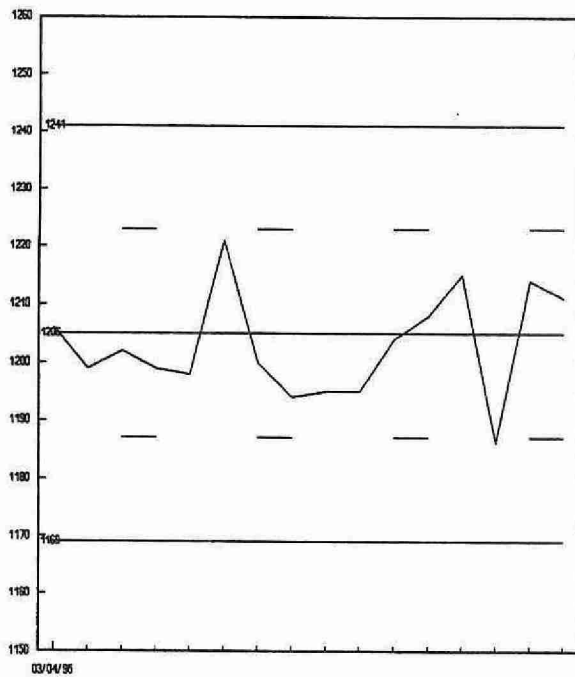
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
44	0.00 - 100	0.3731	4.7
8	101 - 500.0	3.1976	0.8
8	501 - 1000	3.0266	0.4
100	Overall	1.5445	

OTHER CHECKS:

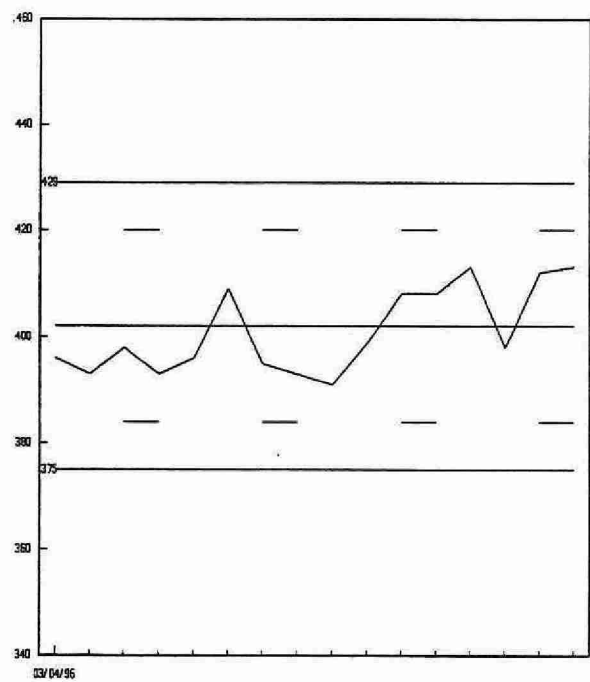
	n	Mean	Standard Deviation (1)
Long Term Blank	16	-1.5	0.6055

LITHIUM ($\mu\text{g/L}$)

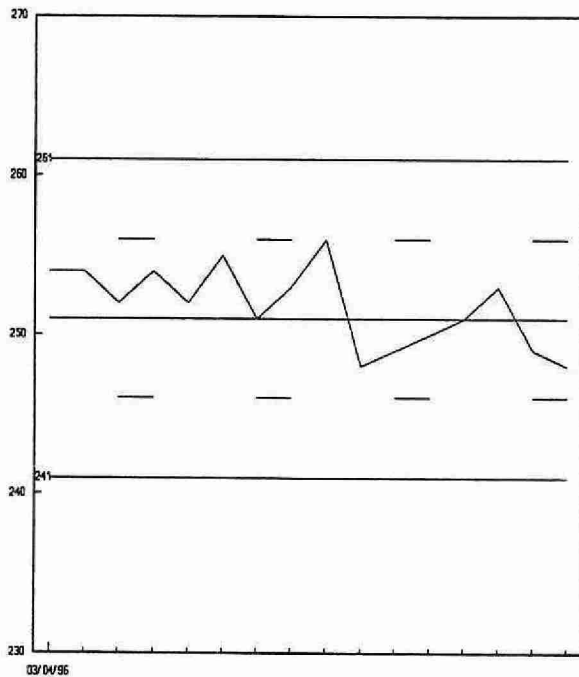
QUALITY CONTROL DATA FROM 01/01/96 TO 31/12/96



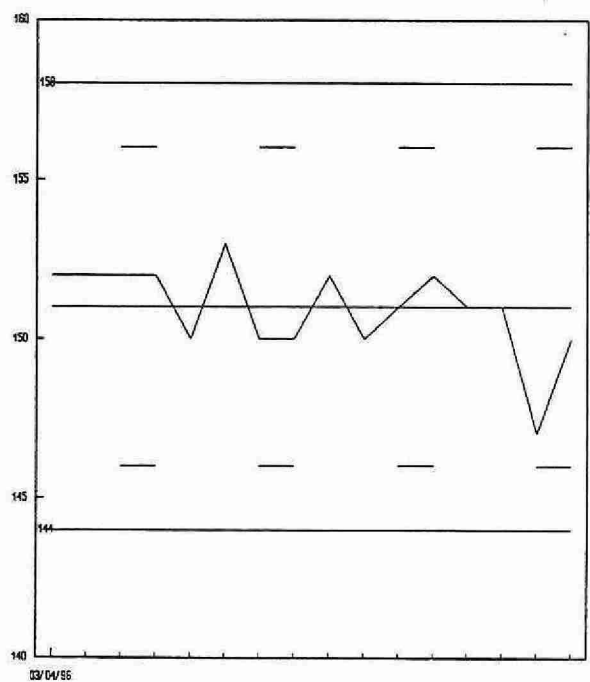
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

———— Control Limit
 ----- Warning Limit

MAGNESIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	18/05/79
Method Reference No.	E3146A	Units	mg/L as Mg
LIMS Product Code	CAT3146	Supervisor	J. McBride
Sample Type/Matrix	Precipitation		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.001	Current T value: 0.005
--------------------------------	------------------------	------------------------

CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

MAGNESIUM

QUALITY CONTROL DATA FROM 05/01/95 TO 10/12/96

Laboratory Unit: Atomic Absorption

Full Scale: to 0.500 mg/L as Mg

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	29	0.30	0.3025	0.0025	0.0029
B:	29	0.05	0.0511	0.0011	0.0010
A+B:	29	0.35	0.3536	0.0036	0.0030
A-B:	29	0.25	0.2514	0.0014	0.0030

s.d.(AB)

S(between runs):

0.002

Sw(within run):

0.002

S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.338 - 0.362 for A+B

0.241 - 0.259 for A-B

DUPLICATES:

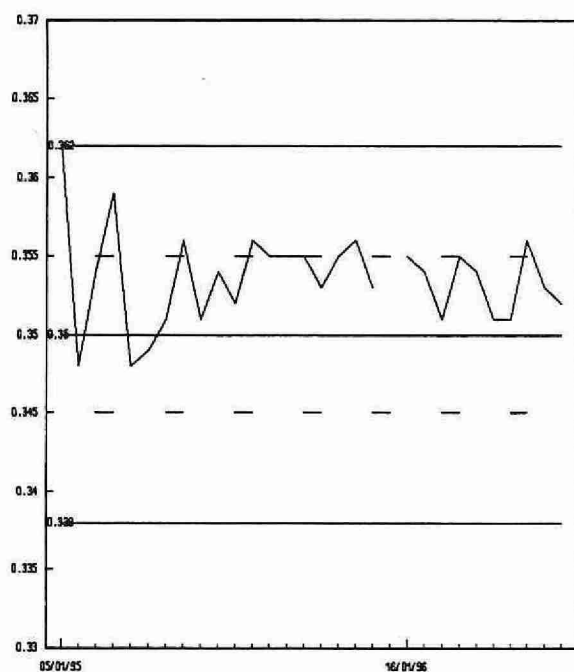
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
40	0.000 - 0.050	0.0007	3.1
8	0.051 - 0.100	0.0013	2.0
16	0.101 - 0.250	0.0013	0.7
11	0.250 - 0.500	0.0025	0.6
75	OVERALL	0.0010	

OTHER CHECKS:

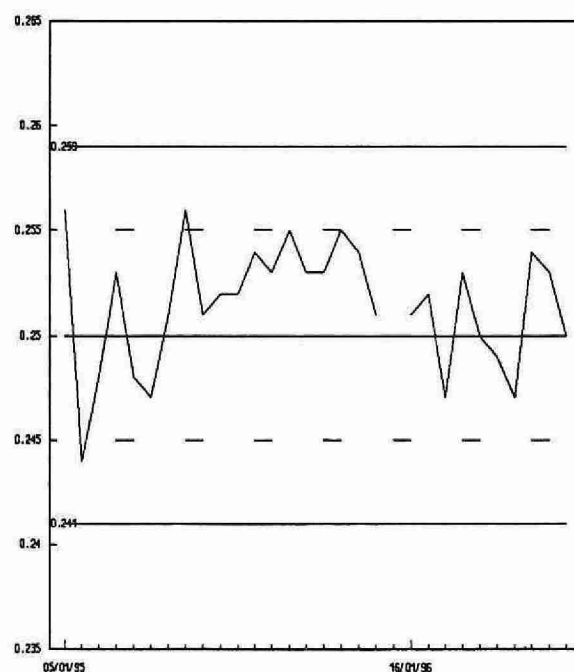
	n	Mean	Standard Deviation (1)
Long Term Blank	29	0.0003	0.0013

MAGNESIUM (mg/L as Mg)

QUALITY CONTROL DATA FROM 05/01/95 TO 10/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

MAGNESIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as Mg
LIMS Product Code	CAT3171,MG3171,HARD3171	Supervisor	J. McBride
Sample Type/Matrix	Surface Waters, DWSP Drinking Waters		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 1.19 at the full scale level.

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 11 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

MAGNESIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96

Laboratory Unit: Atomic Absorption

Full Scale: to 10.0 mg/L as Mg

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	202	8.00	8.09	0.09	0.0667
B:	202	2.00	2.05	0.05	0.0283
C:	202	0.50	0.510	0.01	0.0110
A+B:	202	10.0	10.14	0.14	0.0825
A-B:	202	6.00	6.04	0.04	0.0609
B+C:	202	2.50	2.56	0.06	0.0361
B-C:	202	1.50	1.54	0.04	0.0233

s.d.(AB) S(between runs): 0.04

Sw(within run): 0.02

S/Sw: 1.2

s.d.(BC) S(between runs): 0.05

Sw(within run): 0.02

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.66	-	10.34	for	A+B
5.75	-	6.25	for	A-B
2.38	-	2.62	for	B+C
1.41	-	1.59	for	B-C

DUPLICATES:

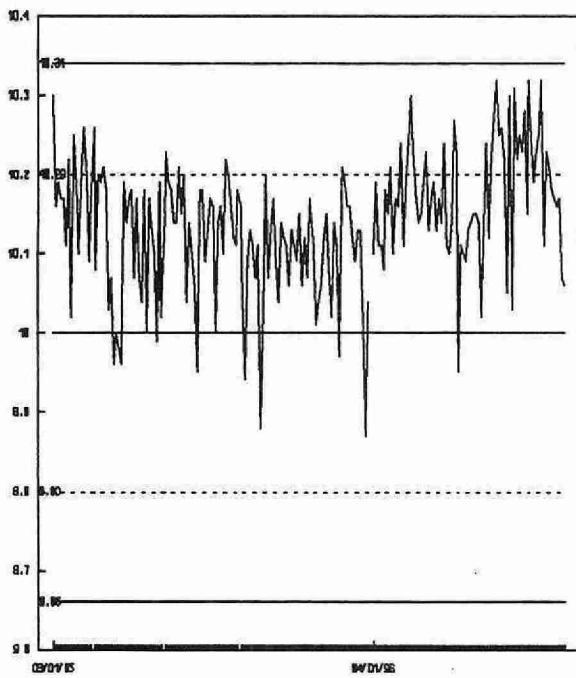
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
76	0.00 - 1.00	0.0163	3.5
51	1.01 - 2.00	0.0199	3.0
166	2.01 - 5.00	0.0336	1.6
128	5.01 - 10.0	0.0661	0.9
421	Overall	0.0387	

OTHER CHECKS:

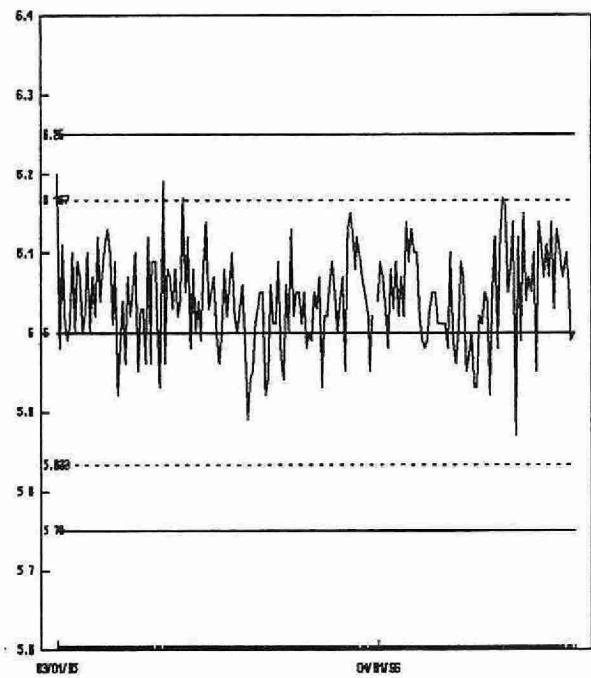
	n	Mean	Standard Deviation (1)
Long Term Blank	202	-0.0011	0.005

MAGNESIUM (mg/L as Mg)

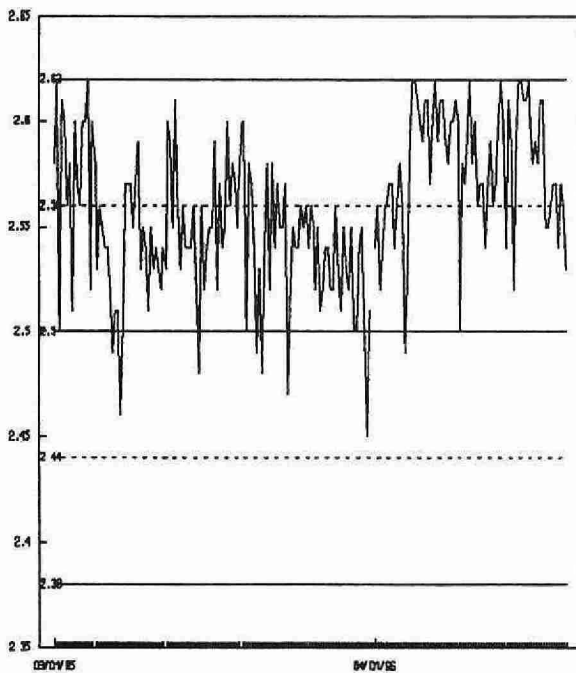
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96



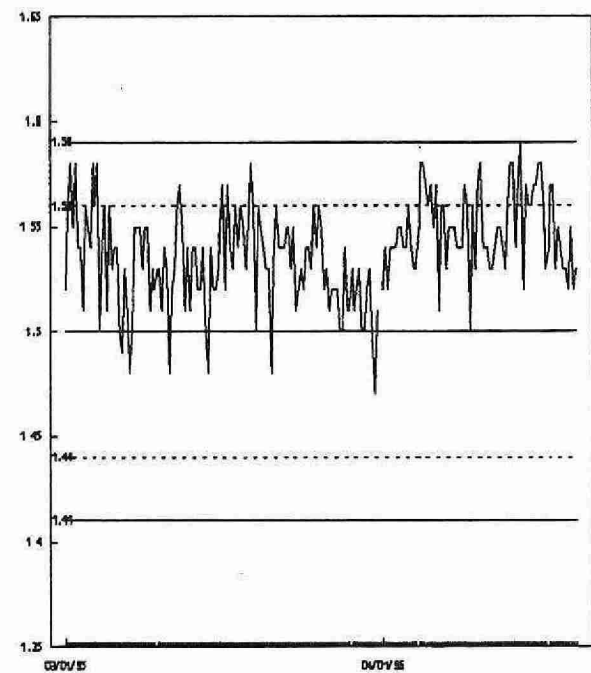
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

MAGNESIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as Mg
LIMS Product Code	CAT3217,CATS3217,HARD3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage, Industrial Wastes		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 1.87 at the full scale level.

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 11 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

MAGNESIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 30/12/96

Laboratory Unit: Absorption

Full Scale: to 50.00 mg/L as Mg

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	296	40.0	39.64	-0.36	0.4670
B:	296	10.0	9.91	-0.09	0.1975
C:	296	2.5	2.49	-0.01	0.0506
A+B:	296	50.0	49.56	-0.44	0.5970
A-B:	296	30.0	29.73	-0.27	0.4061
B+C:	296	12.5	12.40	-0.10	0.2413
B-C:	296	7.5	7.42	-0.08	0.1651

s.d.(AB) S(between runs): 0.36 Sw(within run): 0.29 S/Sw: 1.2
s.d.(BC) S(between runs): 0.14 Sw(within run): 0.12 S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

47.80 - 52.20 for A+B
28.50 - 31.50 for A-B
11.45 - 13.55 for B+C
6.80 - 8.20 for B-C

DUPLICATES:

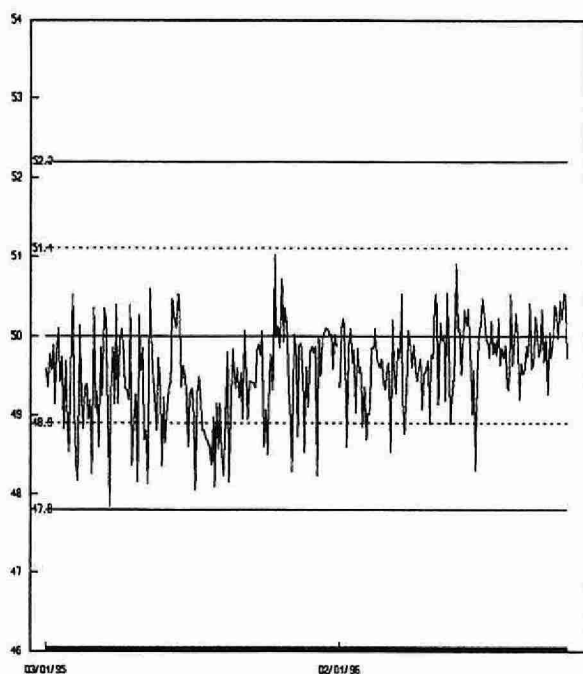
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
198	0.00 - 5.00	0.0368	3.0
211	5.01 - 10.00	0.0797	1.6
288	10.01 - 25.00	0.1452	0.9
158	25.01 - 50.00	0.2856	0.9
855	Overall	0.1194	

OTHER CHECKS:

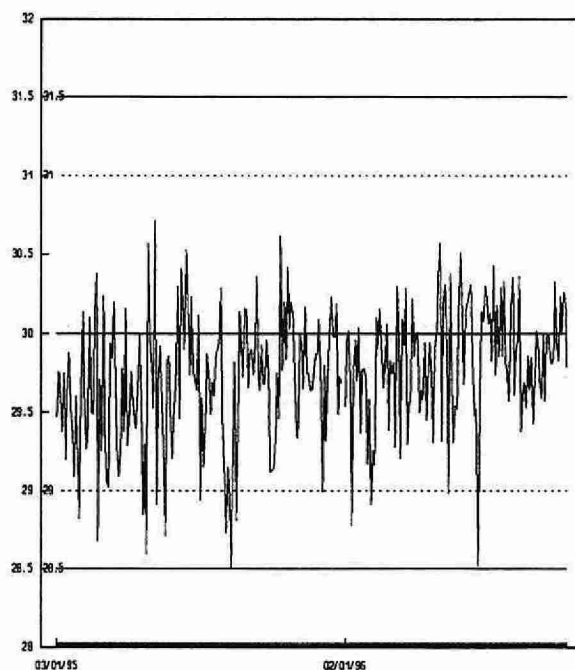
	n	Mean	Standard Deviation (1)
Long Term Blank	294	-0.0037	0.0233

MAGNESIUM (mg/L as Mg)

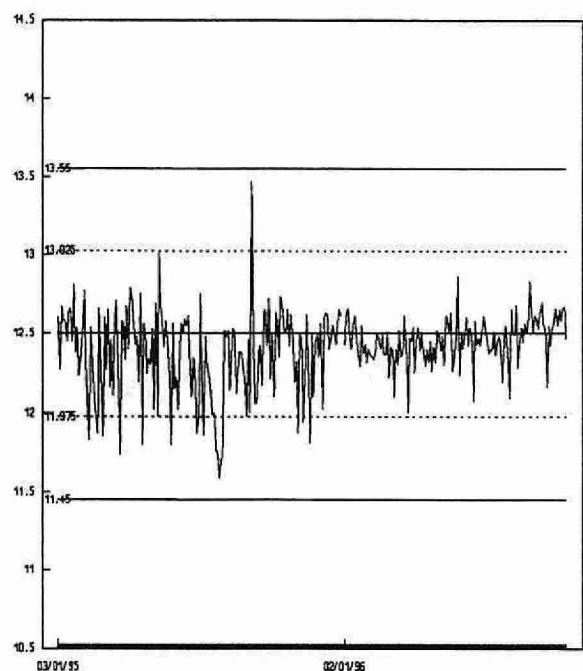
QUALITY CONTROL DATA FROM 03/01/95 TO 30/12/96



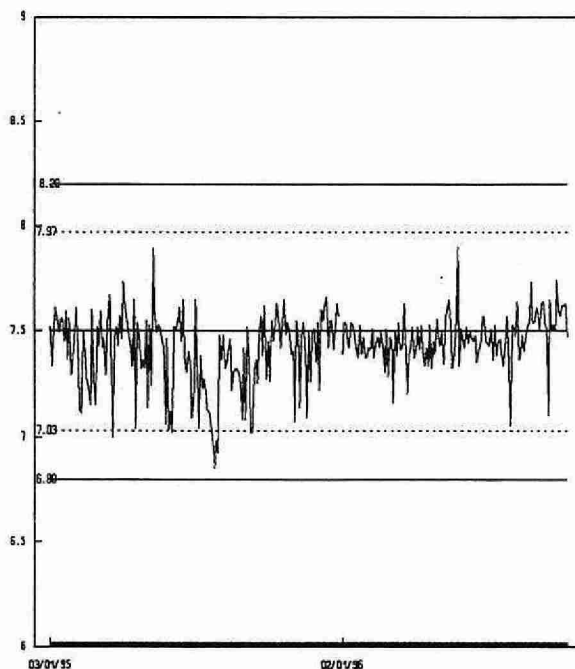
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

MAGNESIUM

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as Mg
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes,		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
--------------------------------	------------------------	------------------------

CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

NOTES:

The control standards are corrected for the LTB from which they were made.

January to June 1996 QC data exceeded the limits on a number of occasions and as a result the uncertainty value associated with reported data during this time period has been assessed to be ± 0.05 mg/L as Mg. (Further information can be attained from the lab (reference 1QCMEM98).

MAGNESIUM

QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/96

Laboratory Unit: Dorset

Full Scale: to 2.0 mg/L as Mg

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	95	1.6	1.583	-0.017	0.0169
B:	95	0.4	0.397	-0.003	0.0066
C:	95	0.1	0.102	0.002	0.0017
A+B:	95	2.0	1.980	-0.020	0.0201
A-B:	95	1.2	1.186	-0.014	0.0155
B+C:	95	0.5	0.498	0.002	0.0067
B-C:	95	0.3	0.295	-0.005	0.0067

s.d.(AB) S(between runs): 0.013 Sw(within run): 0.010 S/Sw: 1.2
s.d.(BC) S(between runs): 0.005 Sw(within run): 0.005 S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.96 - 2.04 for A+B
1.17 - 1.23 for A-B
0.483 - 0.517 for B+C
0.287 - 0.313 for B-C

DUPLICATES:

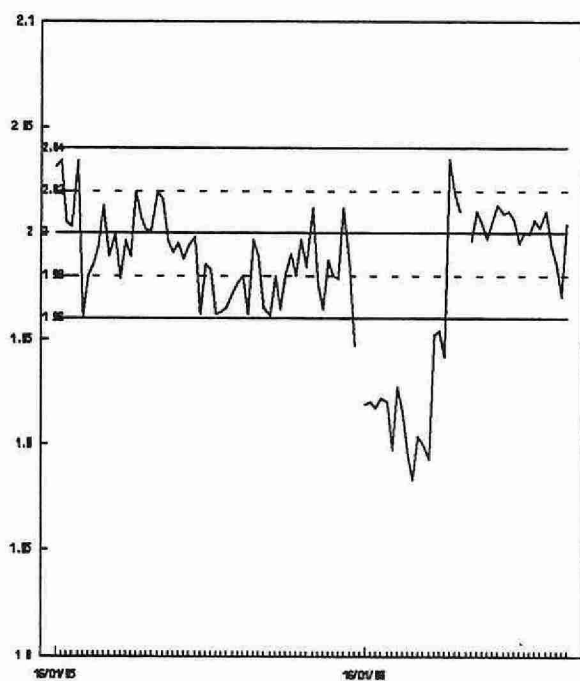
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
49	0.00 - 0.20	0.0015	3.6
28	0.21 - 0.40	0.0096	3.8
169	0.41 - 1.00	0.0094	1.9
10	1.01 - 2.00	0.0492	3.8
256	Overall	0.0082	

OTHER CHECKS:

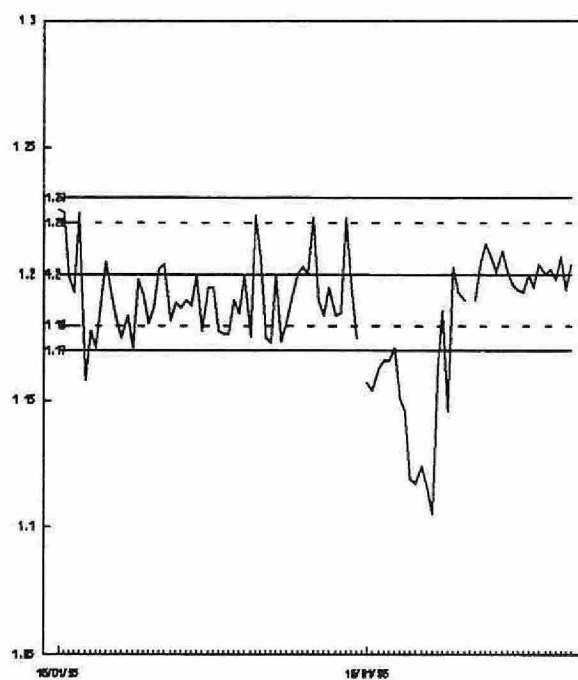
	n	Mean	Standard Deviation (1)
Long Term Blank	94	8.5 ^{E-05}	0.0013

MAGNESIUM (mg/L as Mg)

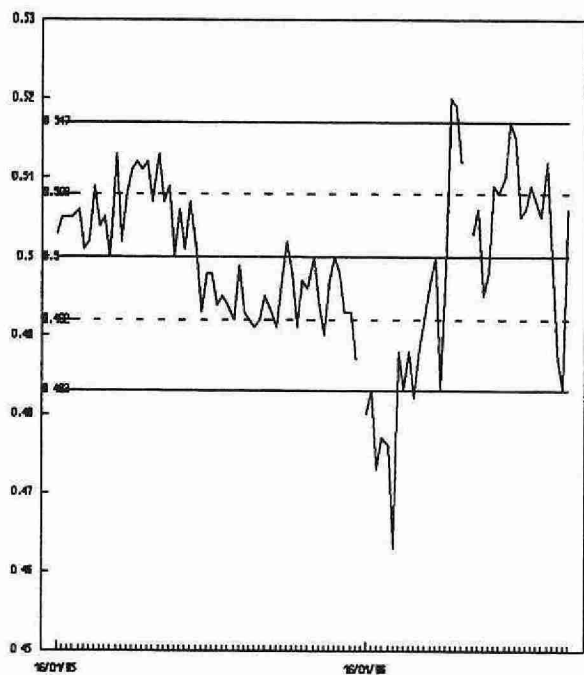
QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/96



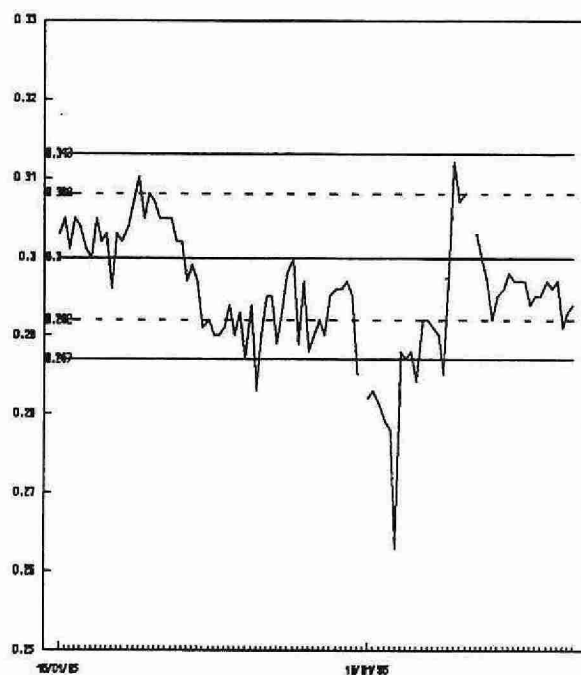
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 - - - - - Warning Limit

MANGANESE, TOTAL

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	1991
Method Reference No.LIS	E3303B	Units	µg/L as Mn
LIMS Product Code	FEMN3303	Supervisor	J. McBride
Sample Type/Matrix	Surface water, precipitation, soil leachates		

SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic, capped, acidified to 0.25% with HNO ₃

ANALYTICAL PROCEDURE:

An undigested sample is introduced to an in-line UV digester. A reducing agent and an ammonium buffer are added to the sample. Formaldoxime complexes with Mn to develop a colour the intensity of which is proportional to the concentration of Mn in the sample. EDTA is then added to complex interferences. The color is read at 480nm. A reference channel is used to counter the effects of residual natural colour in the sample. In the reference channel the EDTA is added prior to the addition of colour reagent.

INSTRUMENTATION:

- An AAII autoanalyzer with colorimeter and automated sampler.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
--------------------------------	--------------------	--------------------

CALIBRATION:

BL plus 4 standards

CONTROLS:

Calibration	Long Term blank, 3 QC's, 4 duplicates
Drift	Blank plus 1 standard every 10 samples.

MANGANESE, TOTAL

QUALITY CONTROL DATA FROM 05/01/95 TO 14/12/96

Laboratory Unit: Dorset

Full Scale: to 200.0 µg/L as Mn

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	71	150.0	150.3	0.3	1.6468
B:	71	50.0	49.7	-0.3	1.5021
C:	71	10.0	10.1	0.1	0.7403
A+B:	71	200.0	200.1	0.1	2.6198
A-B:	71	100.0	100.6	0.6	1.6910
B+C:	71	60.0	59.9	-0.1	1.7652
B-C:	71	40.0	39.6	-0.4	1.5832

s.d.(AB)	S(between runs):	1.6	Sw(within run):	1.2	S/Sw:	1.3
s.d.(BC)	S(between runs):	1.2	Sw(within run):	1.1	S/Sw:	1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

193	-	207	for	A+B
95	-	105	for	A-B
55	-	65	for	B+C
36.5	-	43.5	for	B-C

DUPLICATES:

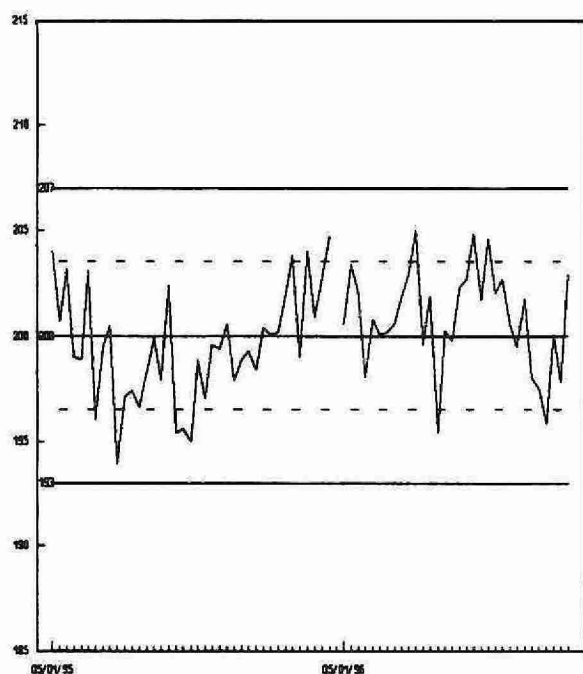
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
95	0.0 - 20.0	0.5644	6.5
72	20.1 - 40.0	1.0555	3.2
59	40.1 - 100.0	1.0900	1.6
12	100.1 - 200.0	1.6827	1.2
238	Overall	0.9253	

OTHER CHECKS:

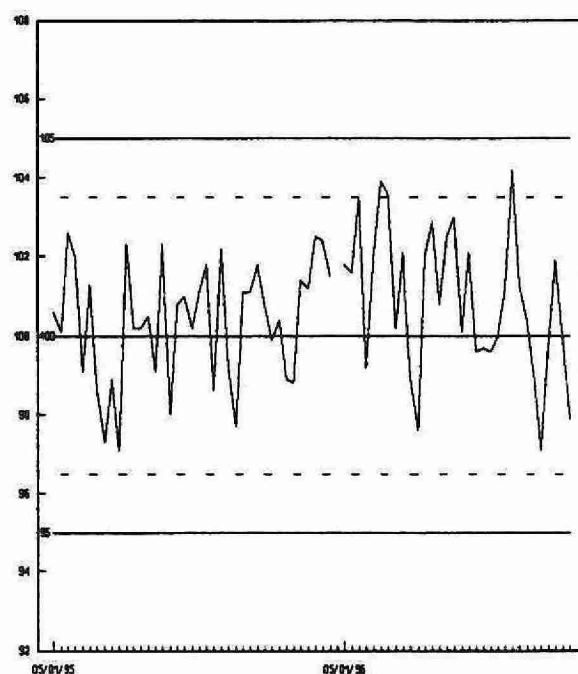
	n	Mean	Standard Deviation (1)
Long Term Blank	71	-0.0437	0.3721

MANGANESE, TOTAL ($\mu\text{g/L}$ as Mn)

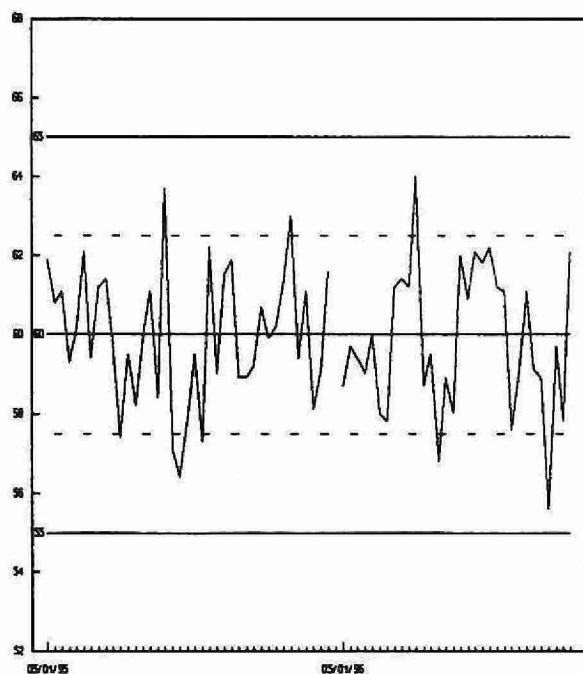
QUALITY CONTROL DATA FROM 05/01/95 TO 14/12/96



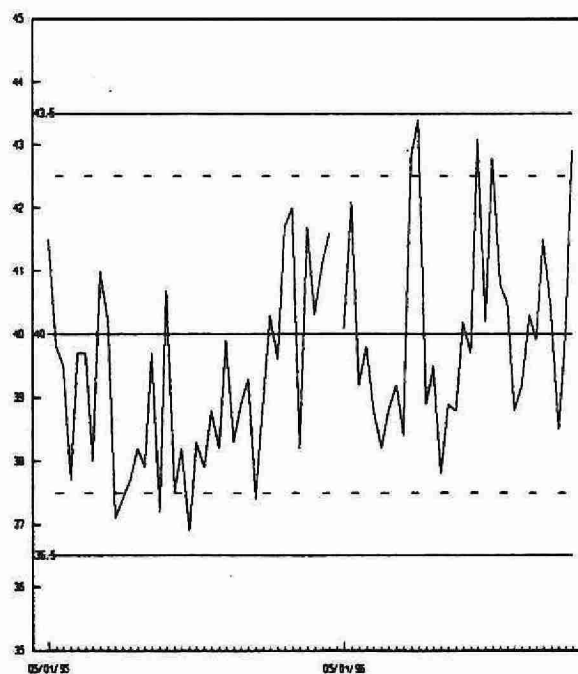
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

_____ Control Limit
 ----- Warning Limit
 -131-

NITRATE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3004A	Units	$\mu\text{g}/\text{m}^3$ as NO_3
LIMS Product Code	ANION3004	Supervisor	J. McBride
Sample Type/Matrix	Glass fibres and high purity quartz filters (Ag and Aq)		

SAMPLING:

Quantity Required	3/4" or 1.9cm strip from 8"x10" filter
Container	50 mL polypropylene tube

SAMPLING PREPARATION:

A 3/4" strip is cut in pieces and deposited into a 50 mL polypropylene tube. 50 mL of Pure-Water is added to the tube. The tube is placed on a horizontal shaker for approximately 1 hour. The supernatant is then filtered into a 15 mL plastic tube and analysed.

ANALYTICAL PROCEDURE:

Nitrate separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of sodium bicarbonate and sodium carbonate and a conductivity detector. The concentration of nitrate (mg/L) is determined by the comparison of the analyte peak area count to that of a series of standards. The analyte result is corrected for the filter blank before the final calculation is made. The result is reported as $\mu\text{g}/\text{m}^3$ as NO_3 .

Chloride and sulphate are determined simultaneously.

INSTRUMENTATION:

Horizontal Shaker, ion chromatographic system plus a PC with ChromPerfect software and DT2804 card for automated sample injection, timing, and data processing.

REPORTING:

Maximum Significant Figures: 2	Current W value: $0.1 \mu\text{g}/\text{m}^3$	Current T value: $0.5 \mu\text{g}/\text{m}^3$
--------------------------------	---	---

CALIBRATION:

6 standards

CONTROLS:

Calibration	MB, IS(n), CS1, and CS2
Drift	Duplicate plus 2 standard approximately every 20 samples

NITRATE cont'd

NOTES:

Duplicate criterion is based on duplicate analysis of the same filter because duplicate filters are not received. To convert unit from mg/L to $\mu\text{g}/\text{m}^3$, the final concentration of NO_3 in mg/L is multiplied by the following formula:

$$\text{Result}(\text{mg/L}) \times 50\text{mL} \times (63/6.75) / \text{air volume} = \mu\text{g}/\text{m}^3$$

Where: 63 is the area of the filter exposed and 6.75 is the sample aliquot are (in^2)

NITRATE

QUALITY CONTROL DATA FROM 02/07/96 TO 31/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 14.7 $\mu\text{g}/\text{m}^3$ as NO_3

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
75	0 - 0.294	0.0906	9.5
31	0.295 - 7.35	0.5123	5.7
2	7.35 - 14.7	N.A.	N.A.
108	Overall	0.1650	

NITROGEN, AMMONIA PLUS AMMONIUM

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/05/84
Method Reference No	E3149A	Units	mg/L as N
LIMS Product Code	AMM3149	Supervisor	J.McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects. Ammonia plus ammonium for dry deposition air filter extracts is also determined using this method.

Approximate absorbance: 0.7 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37°C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5cm light path at 630 nm. Data capture, reduction and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.002	Current T value: 0.01
--------------------------------	------------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

NOTES:

Filter Extracts: Ammonia plus ammonium ions are determined on an extract from a dry deposition air filter. The analytical values are multiplied by 25 and reported as $\mu\text{g}/\text{filter}$ as N. For quality control data see method E3364A for this parameter (multiply the QC data by 25 for data reported as $\mu\text{g}/\text{filter}$).

NITROGEN, AMMONIA PLUS AMMONIUM

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3364A	Units	mg/L as N
LIMS Product Code	DISNUT3364	Supervisor	M. Rawlings
Sample Type/Matrix	Rivers, Lakes, Soil Extracts, Effluents		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects.

Approximate absorbance: 0.5 at the full scale level.

Nitrate plus nitrite, nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37°C heating bath (7.7 mL delay).

Colourimetric measurement is through a 1.5 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.002	Current T value: 0.01
--------------------------------	------------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

NITROGEN, AMMONIA PLUS AMMONIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 18/12/96

Laboratory Unit: Colourimetry

Full Scale: to 2.00 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	184	1.60	1.594	-0.006	0.0118
B:	184	0.800	0.798	-0.002	0.0075
C:	184	0.160	0.161	0.001	0.0050
A+B:	184	2.40	2.39	-0.01	0.0154
A-B:	184	0.800	0.796	-0.004	0.0123
B+C:	184	0.960	0.959	-0.001	0.0103
B-C:	184	0.640	0.637	-0.003	0.0076

s.d.(AB)	S(between runs):	0.0099	Sw(within run):	0.0087	S/Sw: 1.1
s.d.(BC)	S(between runs):	0.0064	Sw(within run):	0.0053	S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.353	-	2.447	for	A+B
0.765	-	0.835	for	A-B
0.931	-	0.989	for	B+C
0.618	-	0.662	for	B-C

DUPLICATES:

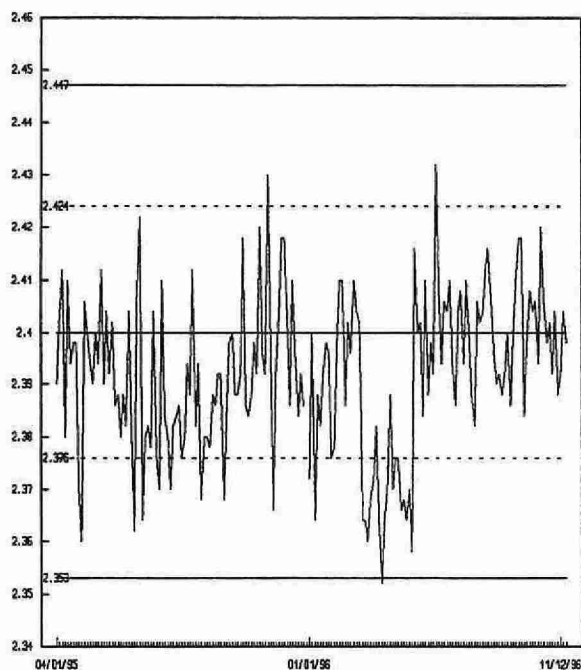
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
430	0.000 - 0.200	0.0074	24.1
20	0.201 - 0.400	0.0171	7.3
18	0.401 - 1.00	0.0584	13.7
5	1.01 - 2.00	0.0631	3.7.
473	Overall	0.0084	

OTHER CHECKS:

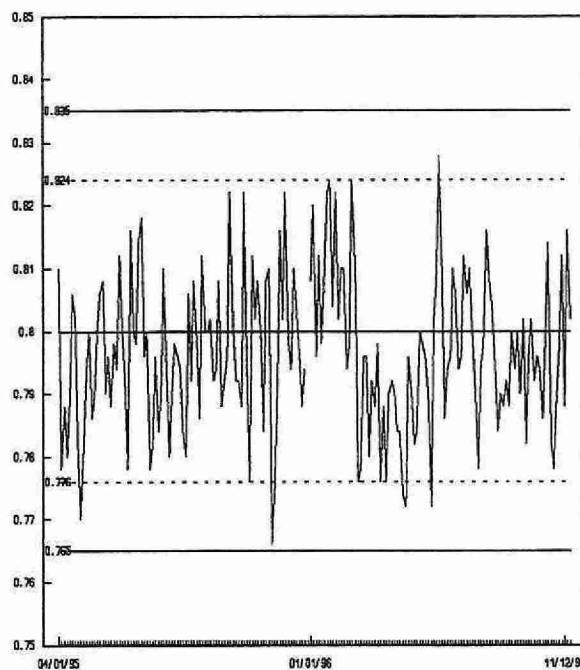
	n	Mean	Standard Deviation (1)
Long Term Blank	184	-0.0001	0.0056

NITROGEN, AMMONIA PLUS AMMONIUM (mg/L as N)

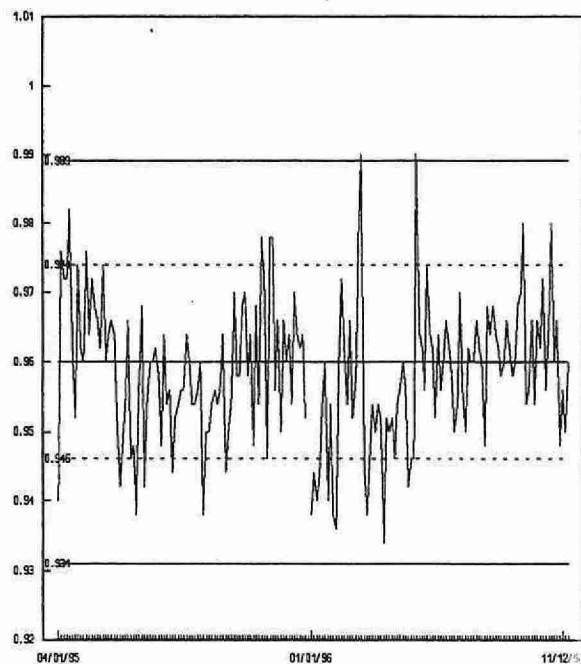
QUALITY CONTROL DATA FROM 03/01/95 TO 18/12/96



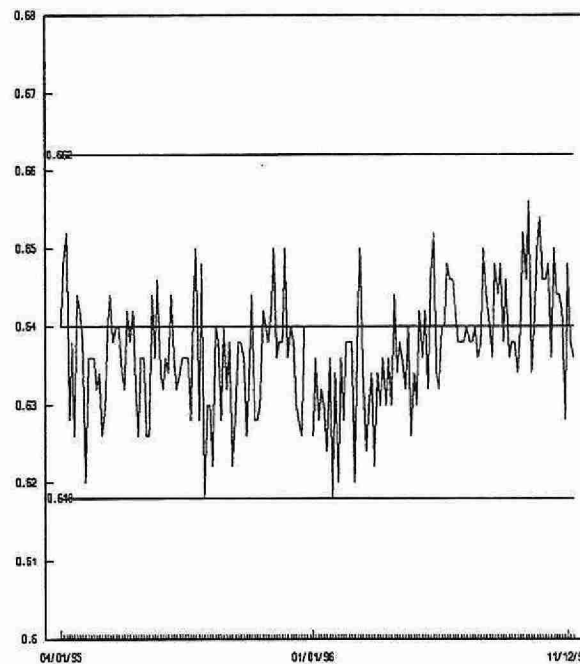
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

———— Control Limit
 ----- Warning Limit

NITROGEN, AMMONIA PLUS AMMONIUM

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/77
Method Reference No	E3366A	Units	mg/L as N
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Leachate, Domestic Waters, Effluents		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst.

Approximate absorbance: 0.7 at the full scale level.

Reactive orthophosphate, nitrogen-nitrite and nitrogen-nitrate plus nitrite are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus one 38°C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 630 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

NITROGEN, AMMONIA PLUS AMMONIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 30/10/96

Laboratory Unit: Colourimetry

Full Scale: to 50.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	136	40.0	40.04	0.04	0.2260
B:	136	20.0	19.999	-0.001	0.1235
C:	136	4.00	4.007	0.007	0.0422
A+B:	136	60.0	60.04	0.04	0.2884
A-B:	136	20.0	20.04	0.04	0.2224
B+C:	136	24.0	24.006	0.006	0.1394
B-C:	136	16.0	15.992	-0.008	0.1210

s.d.(AB)	S(between runs):	0.18	Sw(within run):	0.16	S/Sw: 1.2
s.d.(BC)	S(between runs):	0.09	Sw(within run):	0.08	S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

58.76	-	61.24	for	A+B
19.07	-	20.93	for	A-B
23.34	-	24.66	for	B+C
15.50	-	16.50	for	B-C

DUPLICATES:

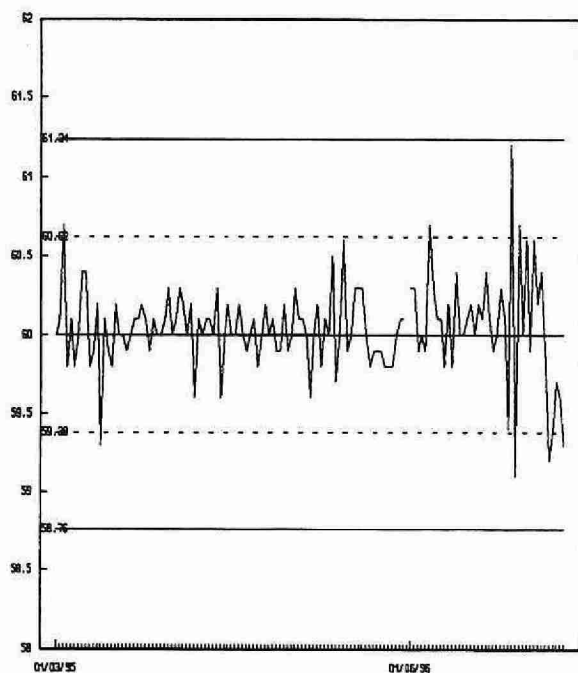
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
344	0.00 - 5.00	0.0427	12.8
27	5.10 - 10.0	0.1692	2.9
32	10.1 - 25.0	0.32196	3.6
5	25.1 - 50.0	0.3451	1.1
408	Overall	0.0565	

OTHER CHECKS:

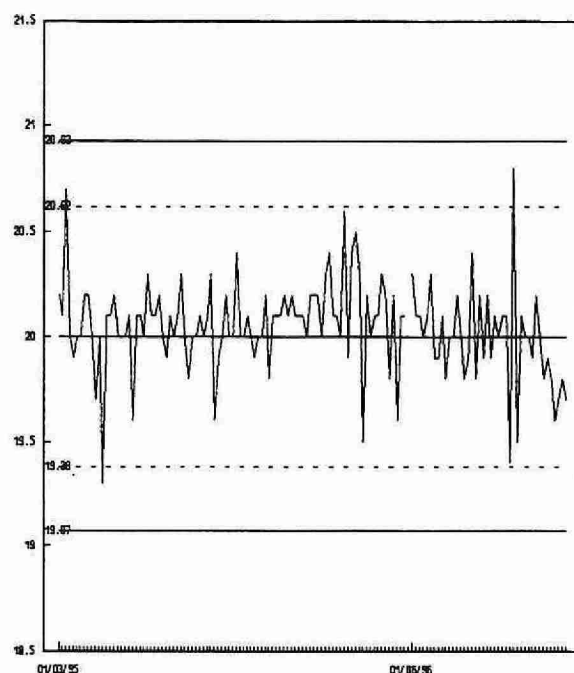
	n	Mean	Standard Deviation (1)
Long Term Blank	136	0 (range -0.15 to 0.2)	0.0400

NITROGEN, AMMONIA PLUS AMMONIUM (mg/L as N)

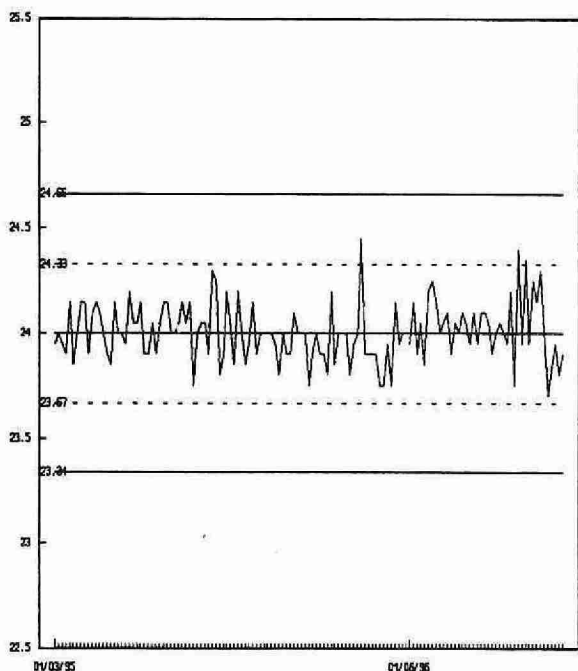
QUALITY CONTROL DATA FROM 03/01/95 TO 30/10/96



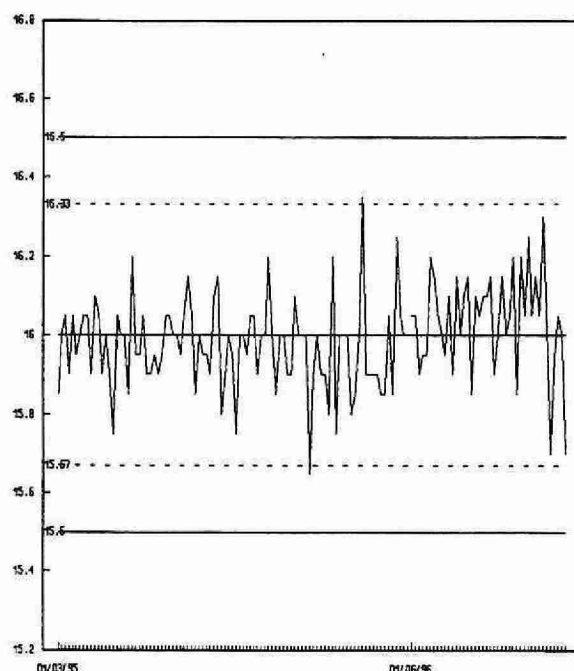
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

———— Control Limit
 - - - - - Warning Limit

NITROGEN, AMMONIA PLUS AMMONIUM

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/06/76
Method Reference No.	E3374A	Units	µg/L as N
LIMS Product Code	AMMNO3374	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, and Soil Leachates		

SAMPLING:

Quantity Required:	50 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects.

Approximate absorbance : 0.40 at the full scale level.

Nitrate plus nitrite is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37°C heating bath (7.7 mL delay). Colourimetric measurement is through a 5.0 cm. light path at 630 nm. Two analytical ranges are obtained from the output of the colourimeter.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
--------------------------------	--------------------	--------------------

CALIBRATION:

BL plus 8 standards

CONTROLS:

Calibration	LTBL plus 3 QC standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

NOTES:

JAN. 1995 LIMS replaced LIS and the method reference no. was changed from E3033A to E3374A. LIMS product code is AMMNO3374.

NITROGEN, AMMONIA PLUS AMMONIUM

QUALITY CONTROL DATA FROM 11/01/95 TO 20/12/96

Laboratory: Dorset

Full Scale: to 1000 µg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	92	600	599.3	-0.7	5.0302
B:	92	200	199.1	-0.9	3.3494
C:	92	60	58.8	-1.2	3.7306
A+B:	92	800	798.4	-1.6	6.4790
A-B:	92	400	400.2	0.2	5.5739
B+C:	92	260	257.9	-2.1	5.8114
B-C:	92	140	140.3	0.3	4.0620

s.d.(AB)	S(between runs):	4.3	Sw(within run):	3.9	S/Sw: 1.1
s.d.(BC)	S(between runs):	3.5	Sw(within run):	2.9	S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

780	-	820	for	A+B
385	-	415	for	A-B
245	-	275	for	B+C
128.75	-	151.25	for	B-C

DUPLICATES:

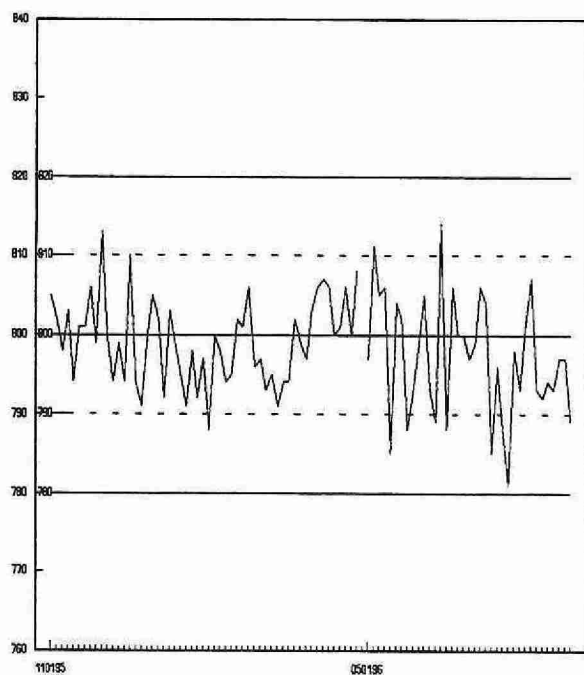
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
234	0.0 - 100	2.3142	9.1
13	101 - 200	3.5366	2.0
13	201 - 500	4.7780	1.4
8	501 - 1000	3.9376	0.6
268	Overall	2.5209	

OTHER CHECKS:

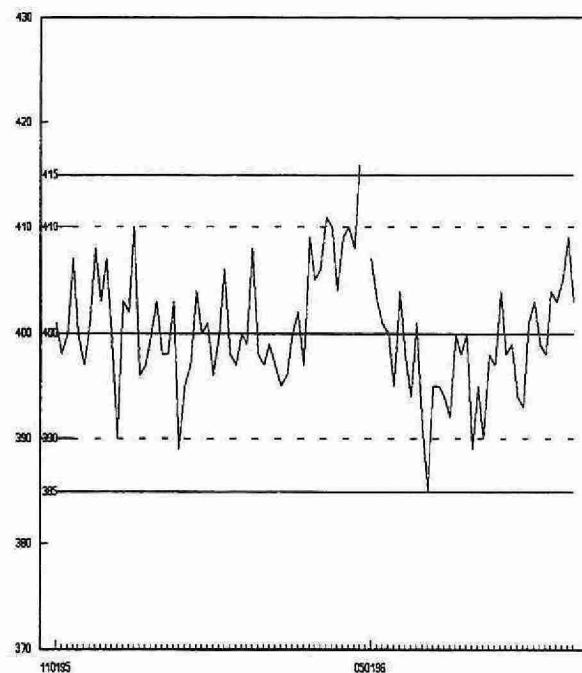
	n	Mean	Standard Deviation (1)
Long Term Blank	92	1.0652	1.0357

NITROGEN, AMMONIA PLUS AMMONIUM ($\mu\text{g/L as N}$)

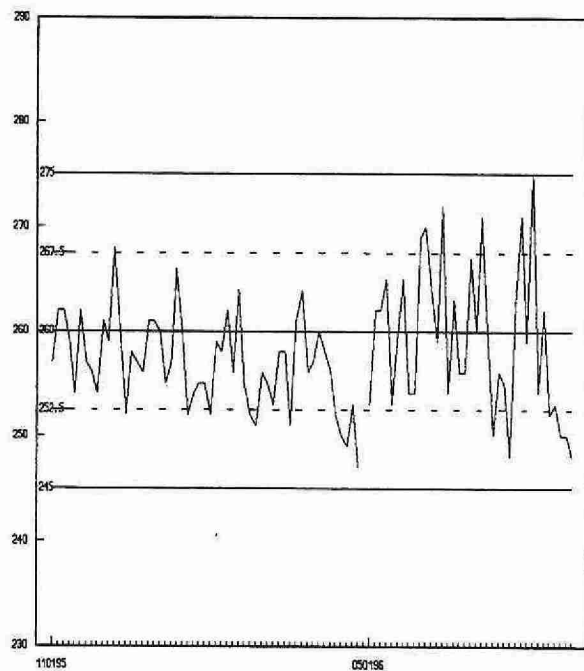
QUALITY CONTROL DATA FROM 11/01/95 TO 20/12/96



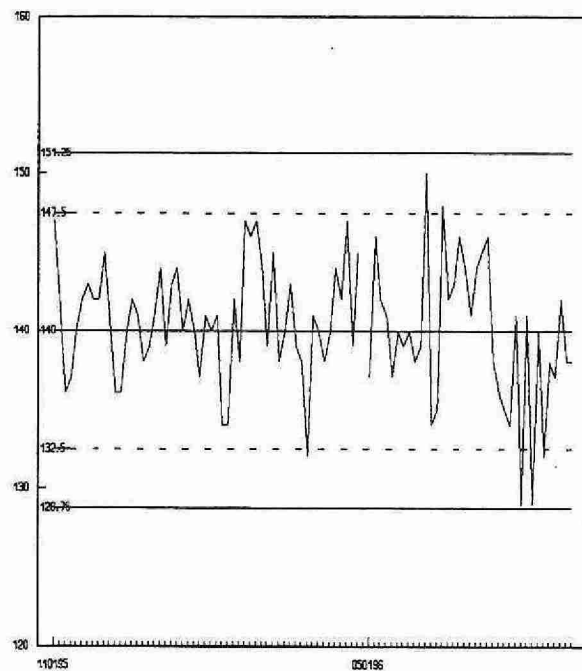
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

NITROGEN, NITRATE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/07/80
Method Reference No	E3148A	Units	µg/Filter as N
LIMS Product Code	LOV3148, ANLOV3148, NYL3148, TEF3148, ANION3148	Supervisor	J. McBride
Sample Type/Matrix	W40 filters from LoVol filter packs, Teflon and Nylon filters from LoVol and Sequential filter packs		

SAMPLING:

Quantity Required	1 filter
Container	50 mL polypropylene tube

SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW (W40) or 25.0 mL of DDW (Teflon) or 25.0 mL of 0.03N NaOH (Nylon) in polypropylene tubes with ultrasonic treatment followed by a 24 hour rest period.

ANALYTICAL PROCEDURE:

Nitrate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of nitrate in mg/L as N is determined by the comparison of the sample peak heights to a series of standards. Results are converted to µg/filter as N.

Chloride and sulphate are determined simultaneously.

INSTRUMENTATION:

Ultrasonic bath; modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01 mg/L	Current T value: 0.05 mg/L
--------------------------------	----------------------------	----------------------------

CALIBRATION:

BL plus 9 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received. To convert unit from mg/L to µg/Filter, the concentration of N in mg/L is multiplied by 50 for W40 filters or 25 for Teflon and Nylon filters.

NITROGEN, NITRATE

QUALITY CONTROL DATA FROM 13/01/95 TO 13/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 2.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	47	1.60	1.606	0.006	0.0177
B:	47	0.40	0.391	-0.009	0.0141
A+B:	47	2.00	1.998	-0.002	0.0299
A-B:	47	1.20	1.215	0.015	0.0113

s.d.(AB)

S(between runs):

0.016

Sw(within run):

0.008

S/Sw: 2.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.93 - 2.07 for A+B
1.15 - 1.25 for A-B

DUPLICATES:

For W40 filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
20	0 - 0.40	0.0037	2.7
17	0.41 - 1.20	0.0011	0.3
3	1.21 - 2.00	0.0014	0.1
40	Overall	0.0022	

For Teflon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
71	0 - 0.20	0.0020	22.9
2	0.21 - 0.40	N.A.	N.A.
4	0.41 - 1.20	0.0182	2.1
2	1.21 - 2.00	N.A.	N.A.
79	Overall	0.0030	

NITROGEN, NITRATE

QUALITY CONTROL DATA FROM 13/01/95 TO 13/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 2.0 mg/L as N

DUPLICATES:

For Nylon filters:

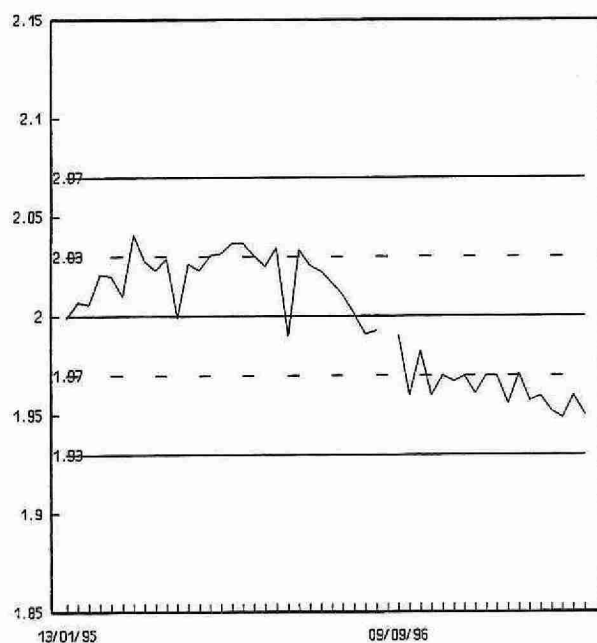
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
86	0 - 0.20	0.0027	2.5
30	0.21 - 0.40	0.0048	2.1
50	0.41 - 1.20	0.0088	1.4
2	1.21 - 2.00	N.A.	N.A.
168	Overall	0.0046	

OTHER CHECKS:

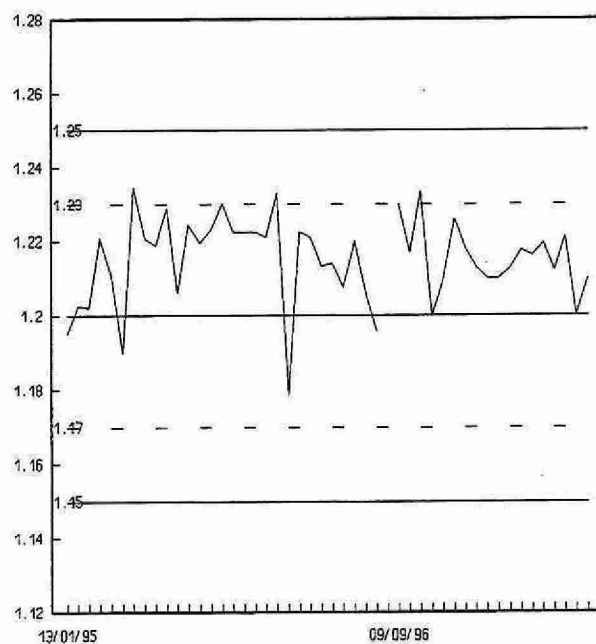
	n	Mean	Standard Deviation (1)
Long Term Blank	47	0.0007	0.0028

NITROGEN, NITRATE (mg/L as N)

QUALITY CONTROL DATA FROM 13/01/95 TO 13/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
 ----- Warning Limit

NITROGEN, NITRATE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3372A	Units	mg/L as N
LIMS Product Code	ANION3372	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

SAMPLING:

Quantity Required	15 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$ to match the eluent strength and maintain background conductivity. The concentration of nitrate in mg/L as N is determined by the comparison of the sample peak heights to a series of standards. Sulphate and chloride are determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Formerly method E3147A, method number changed for LIMS in 1993 to E3372A.

NITROGEN, NITRATE

QUALITY CONTROL DATA FROM 12/01/95 TO 10/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 1.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	35	0.80	0.806	0.006	0.0104
B:	35	0.20	0.197	-0.003	0.0102
A+B:	35	1.00	1.003	0.003	0.0183
A-B:	35	0.60	0.610	0.010	0.0093

s.d.(AB) S(between runs): 0.010 Sw(within run): 0.007 S/Sw: 1.6

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.96 - 1.04 for A+B
0.57 - 0.63 for A-B

DUPLICATES:

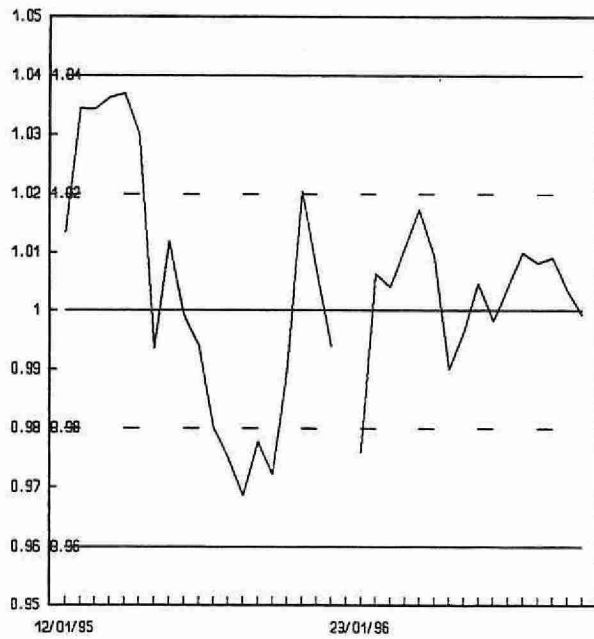
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
12	0.00 - 0.20	0.0045	7.9
20	0.21 - 0.50	0.0058	3.9
12	0.51 - 1.00	0.0116	3.2
44	Overall	0.0071	

OTHER CHECKS:

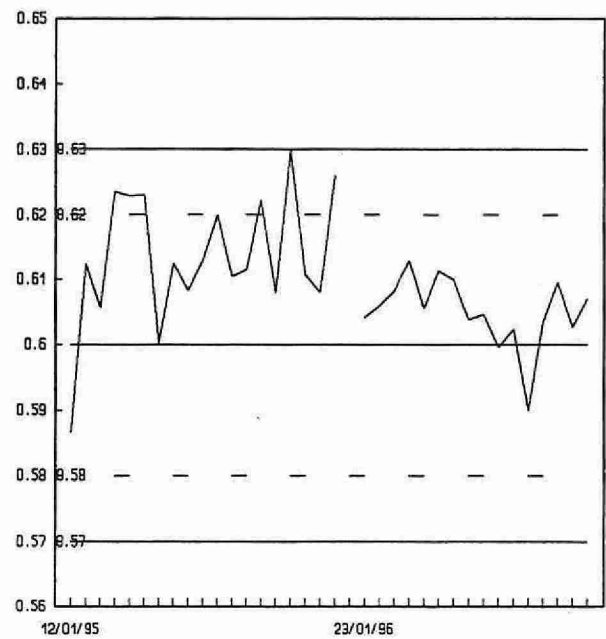
	n	Mean	Standard Deviation (1)
Long Term Blank	35	0.0011	0.0047

NITROGEN, NITRATE (mg/L as N)

QUALITY CONTROL DATA FROM 12/01/95 TO 10/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

NITROGEN, NITRATE PLUS NITRITE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3364A	Units	mg/L as N
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 37°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step.

Approximate absorbance: 0.6 at the full scale level.

Ammonia plus ammonium, nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37°C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 1.5 cm. light path at 520 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
--------------------------------	------------------------	------------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NITROGEN, NITRATE PLUS NITRITE

QUALITY CONTROL DATA FROM 03/01/95 TO 18/12/96

Laboratory Unit: Colourimetry

Full Scale: to 5.00 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	184	4.00	4.01	0.01	0.0458
B:	184	2.00	2.008	0.008	0.0316
C:	184	0.400	0.403	0.003	0.0280
A+B:	184	6.00	6.01	0.01	0.0628
A-B:	184	2.00	1.999	-0.001	0.0474
B+C:	184	2.40	2.41	0.01	0.0518
B-C:	184	1.60	1.605	0.005	0.0299

s.d.(AB)	S(between runs):	0.039	Sw(within run):	0.033	S/Sw: 1.2
s.d.(BC)	S(between runs):	0.030	Sw(within run):	0.021	S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

5.868	-	6.132	for	A+B
1.901	-	2.099	for	A-B
2.328	-	2.472	for	B+C
1.546	-	1.654	for	B-C

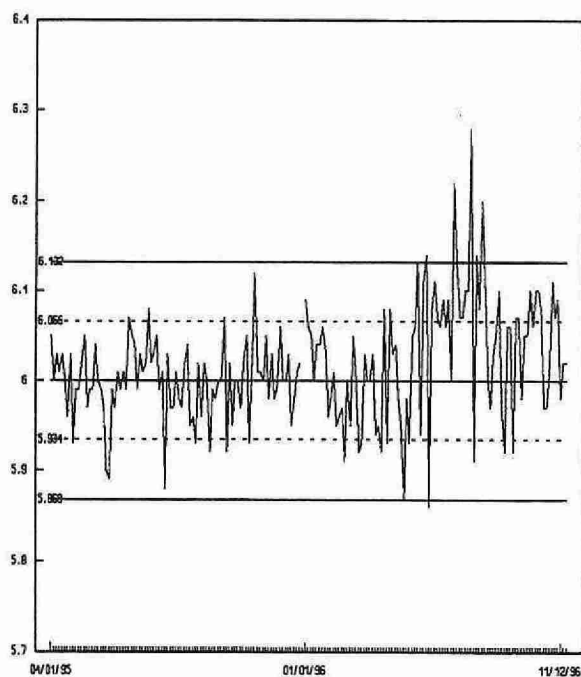
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
312	0.000 - 0.500	0.0140	18.5
50	0.501 - 1.00	0.0192	10.0
82	1.01 - 2.50	0.0417	5.8
41	2.51 - 5.00	0.0827	2.4
485	Overall	0.0220	

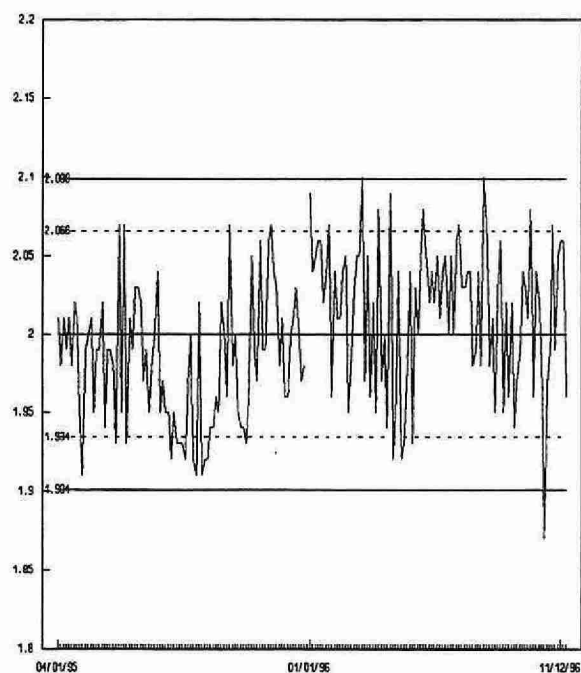
OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	184	-0.0029	0.0503

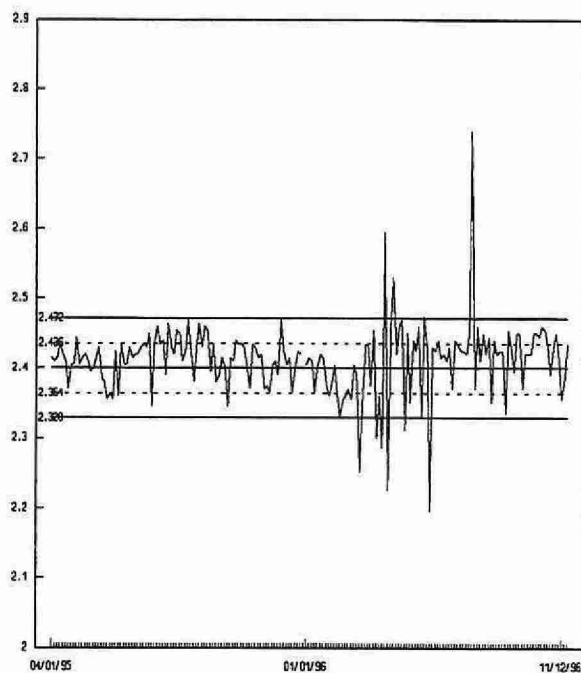
NITROGEN, NITRATE PLUS NITRITE (mg/L as N)
 QUALITY CONTROL DATA FROM 03/01/95 TO 18/12/96



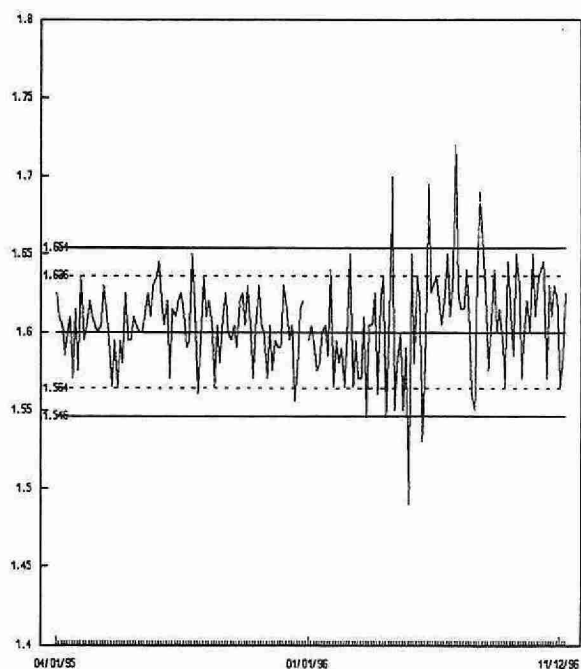
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

————— Control Limit
 - - - - - Warning Limit

NITROGEN, NITRATE PLUS NITRITE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3366A	Units	mg/L as N
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Leachate, Domestic Waters		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 38°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step. Approximate absorbance: 0.7 at the full scale level. Ammonia plus ammonium, nitrite, and reactive phosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 38°C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 520 nm. Two analytical ranges are obtained from the output of the colourimeter. Data capture, reduction, and processing via a multi - stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NITROGEN, NITRATE PLUS NITRITE

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96

Laboratory Unit: Colourimetry

Full Scale: to 50.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	143	40.0	39.996	-0.004	0.2696
B:	143	20.0	19.990	-0.010	0.1639
C:	143	4.00	3.993	-0.007	0.0613
A+B:	143	60.0	59.956	-0.046	0.3514
A-B:	143	20.0	19.977	0.023	0.2749
B+C:	143	24.0	23.983	-0.013	0.1978
B-C:	143	16.0	15.997	-0.003	0.1487

s.d.(AB)	S(between runs):	0.223	Sw(within run):	0.194	S/Sw: 1.1
s.d.(BC)	S(between runs):	0.124	Sw(within run):	0.105	S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

58.66	-	61.34	for	A+B
18.99	-	21.01	for	A-B
23.28	-	24.72	for	B+C
15.46	-	16.54	for	B-C

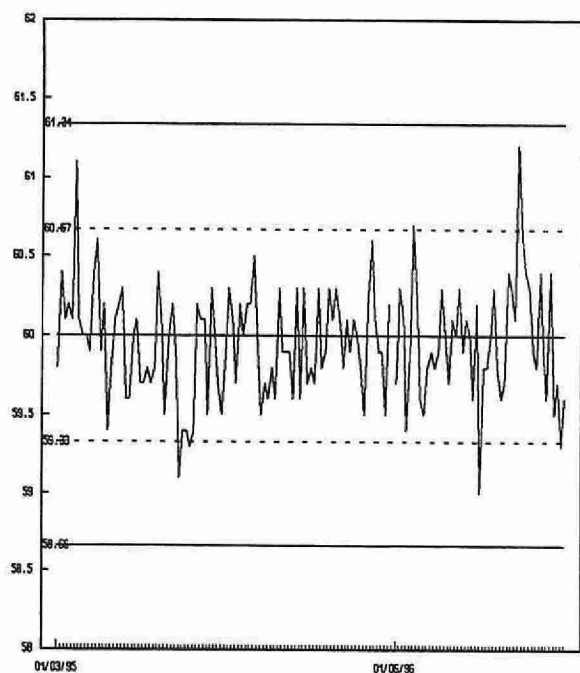
DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
292	0.000 - 5.00	0.0392	6.4
50	5.01 - 10.0	0.1095	9.0
77	10.1 - 25.0	0.2114	1.9
7	25.1 - 50.0	0.4567	1.2
426	Overall	0.0713	

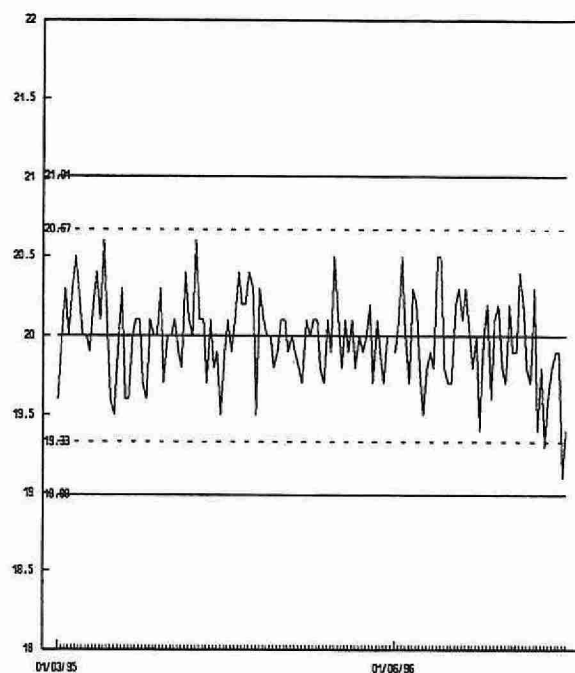
OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	143	0.0136	0.0472

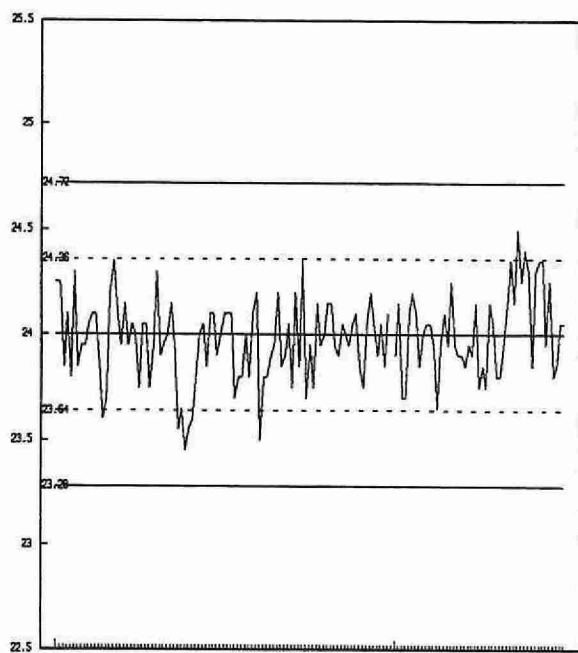
NITROGEN, NITRATE PLUS NITRITE (mg/L as N)
 QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96



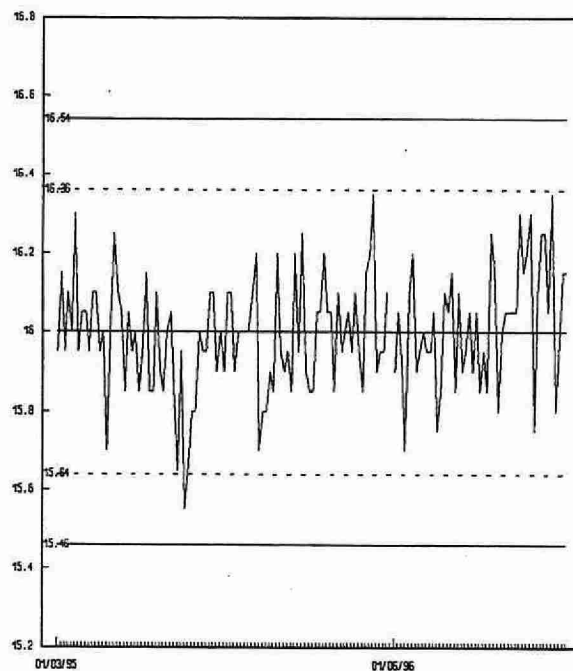
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

————— Control Limit
 ----- Warning Limit

NITROGEN, NITRATE PLUS NITRITE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/76
Method Reference No	E3369A	Units	mg/L as N
LIMS Product Code	FNOT3369	Supervisor	J. McBride
Sample Type/Matrix	Ministry of Health Water Samples		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 38°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37°C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 1.5 cm. light path at 520 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.1	Current T value: 0.5
--------------------------------	----------------------	----------------------

CALIBRATION:

BL plus 6 standards

CONTROLS:

Calibration	LTB plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NOTES:

Sept.'94 the method codes WFNO3-E3221A, and E3220A were amalgamated and a new method code WFNO3-E3369A was generated.

NITROGEN, NITRATE PLUS NITRITE

QUALITY CONTROL DATA FROM 04/01/95 TO 20/12/96

Laboratory Unit: Colourimetry

Analytical Range: to 20.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	130	16.0	16.003	0.003	0.1019
B:	130	8.0	8.042	0.042	0.0657
C:	130	1.60	1.603	0.003	0.0230
A+B:	130	24.0	24.045	0.045	0.1330
A-B:	130	8.0	7.961	-0.039	0.1082
B+C:	130	9.60	9.646	0.046	0.0749
B-C:	130	6.40	6.438	0.038	0.0640

s.d.(AB) S(between runs): 0.086 Sw(within run): 0.076 S/Sw: 1.12

s.d.(BC) S(between runs): 0.049 Sw(within run): 0.045 S/Sw: 1.1

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

23.21	-	24.79	for	A+B
7.41	-	8.59	for	A-B
9.15	-	10.05	for	B+C
5.95	-	6.85	for	B-C

DUPLICATES:

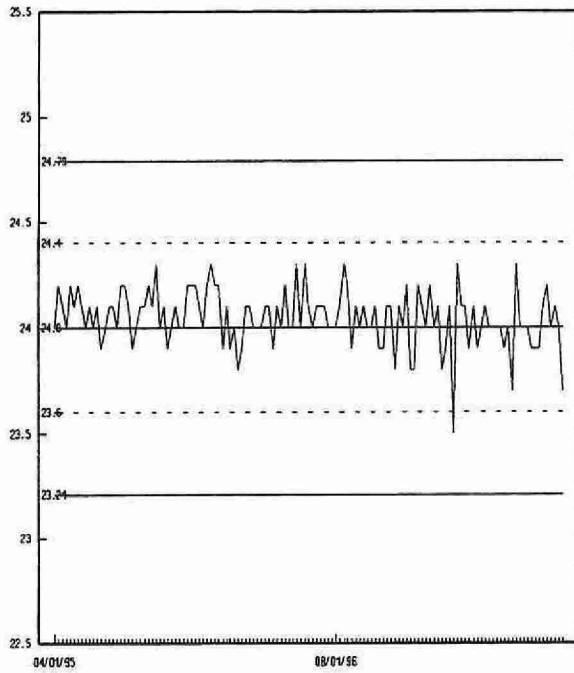
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
300	0 - 2.0	0.0352	9.5
30	2.1 - 4.0	0.0924	3.2
32	4.1 - 10.0	0.0893	1.2
15	10.1 - 20.0	0.2233	1.9
377	Overall	0.0708	

OTHER CHECKS:

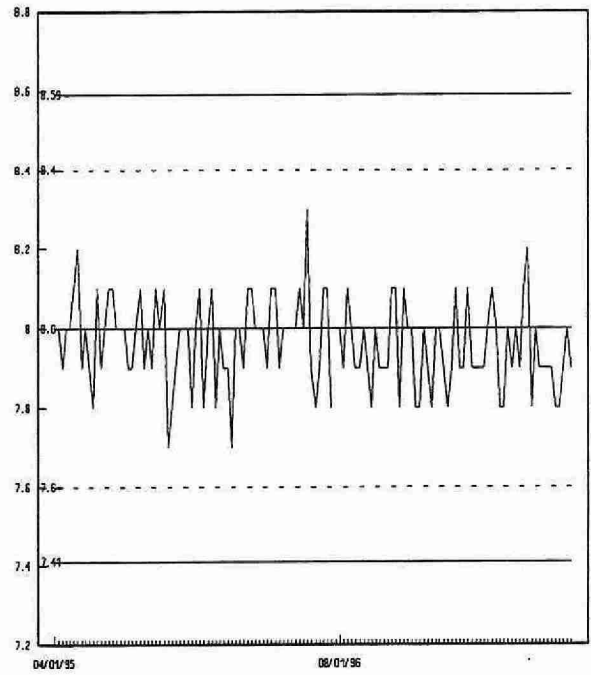
	n	Data Mean	Standard (1) Deviation
Long Term Blank	130	0.0008	0.0088

NITROGEN, NITRATE PLUS NITRITE (mg/L as N)

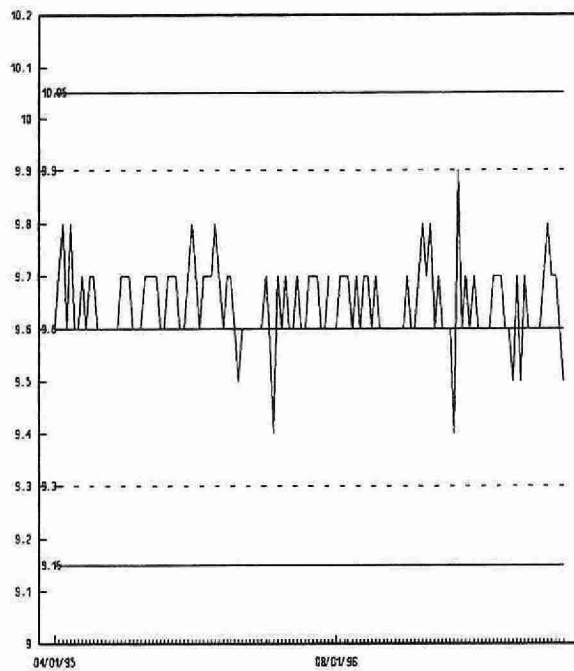
QUALITY CONTROL DATA FROM 04/01/95 TO 20/12/96



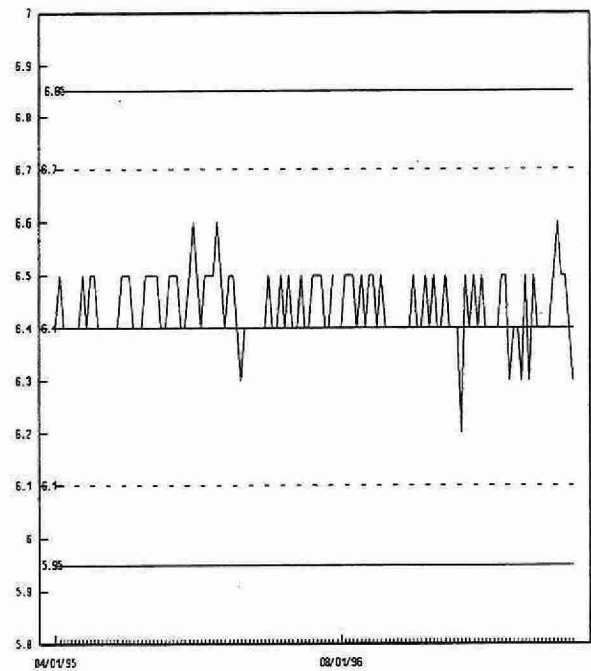
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

————— Control Limit
 - - - - - Warning Limit

NITROGEN, NITRATE PLUS NITRITE

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	13/06/78
Method Reference No.	E3374A	Units	g/L as N
LIMS Product Code	AMMNO3374	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, and Soil Leachates		

SAMPLING:

Quantity Required:	50 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a sample. Nitrate is reduced to nitrite in alkaline media at 37°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step.

Approximate absorbance : 0.4 at the full scale level.

Ammonia plus ammonium is determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37°C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 5.0 cm. light path at 520 nm.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
--------------------------------	--------------------	---------------------

CALIBRATION:

BL plus 8 standards

CONTROLS:

Calibration	LTBL plus 3 QC standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

NOTES:

JAN. 1995 LIMS replaced LIS and the method reference no. was changed from E3034A to E3374A. LIMS product code is AMMNO3374.

NITROGEN, NITRATE PLUS NITRITE

QUALITY CONTROL DATA FROM 11/01/95 TO 20/12/96

Laboratory: Dorset

Full Scale: to 1000 µg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	91	600	601.7	1.7	6.2926
B:	91	200	199.5	-0.5	2.9936
C:	91	60	60.1	0.1	1.8633
A+B:	91	800	801.2	1.2	8.1528
A-B:	91	400	402.1	2.1	5.5361
B+C:	91	260	259.6	-0.4	3.9346
B-C:	91	140	138.5	-1.5	3.0635

s.d.(AB)	S(between runs):	4.93	Sw(within run):	3.91	S/Sw: 1.3
s.d.(BC)	S(between runs):	2.49	Sw(within run):	2.17	S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

780	-	820	for	A+B
385	-	415	for	A-B
245	-	275	for	B+C
128.75	-	151.25	for	B-C

DUPLICATES:

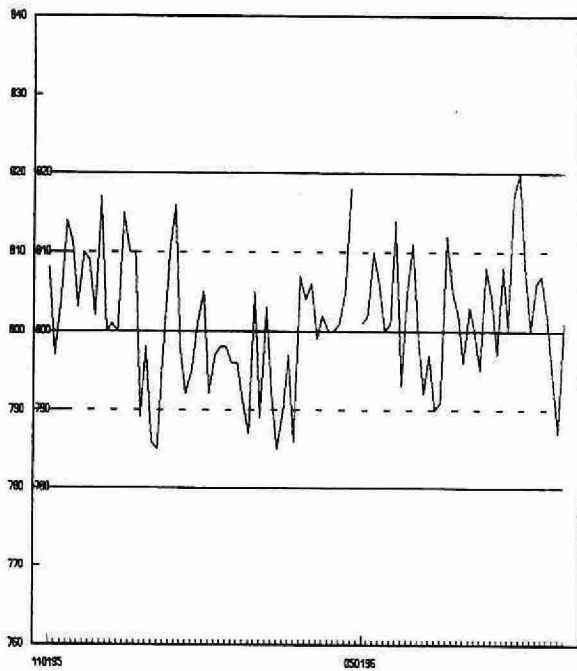
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
148	0.0 - 100	1.3674	6.7
56	101 - 200	3.6110	2.7
45	201 - 500	3.9780	1.5
15	501 - 1000	7.1524	1.4
264	Overall	2.5764	

OTHER CHECKS:

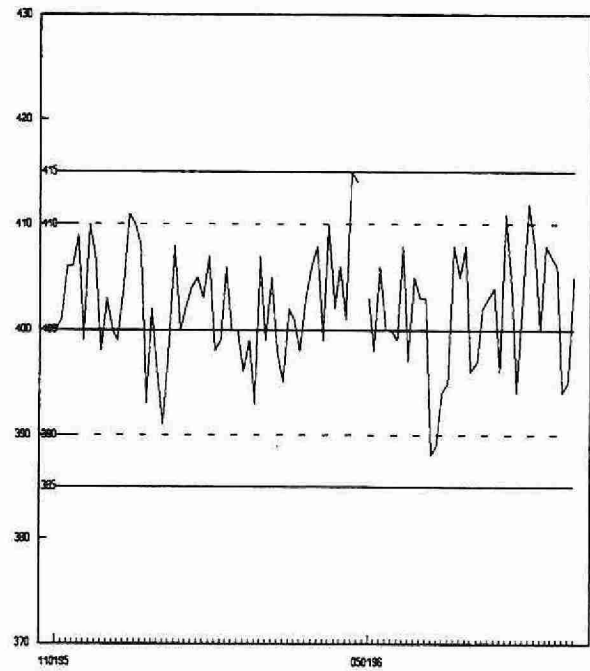
	n	Mean	Standard Deviation (1)
Long Term Blank	91	0.4066	0.8025

NITROGEN, NITRATE PLUS NITRITE ($\mu\text{g/L as N}$)

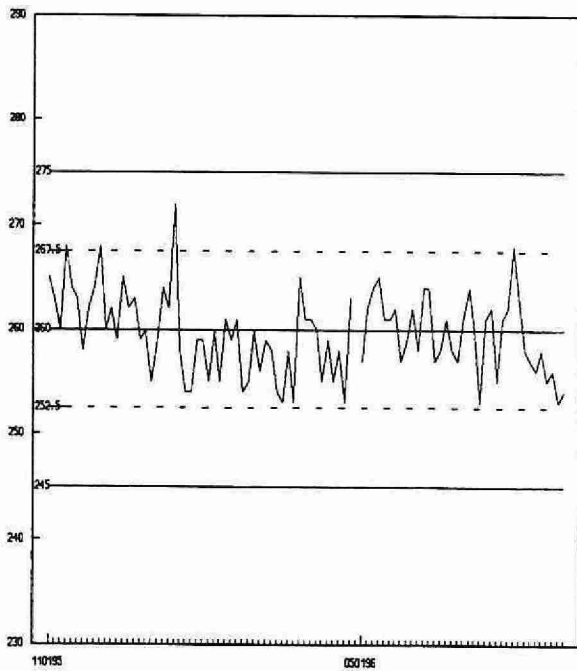
QUALITY CONTROL DATA FROM 11/01/95 TO 20/12/96



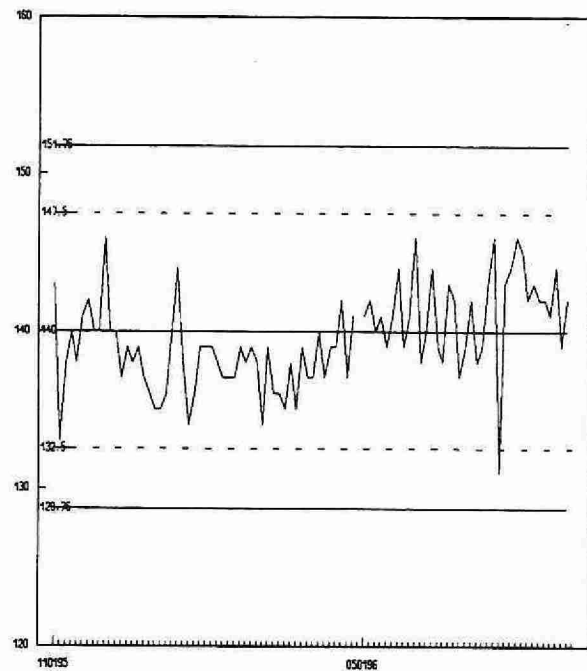
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 - - - - - Warning Limit

NITROGEN, NITRITE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3364A	Units	mg/L as N
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrite is determined on the supernatant of a settled sample by formation of an azo dye using sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride.

Approximate absorbance: 0.6 at the full scale level.

Ammonia plus ammonium, nitrate plus nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 520 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.001	Current T value: 0.005
--------------------------------	------------------------	------------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NITROGEN, NITRITE

QUALITY CONTROL DATA FROM 04/01/95 TO 18/12/96

Laboratory Unit: Colourimetry

Full Scale: to 0.200 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	184	0.160	0.161	0.001	0.0014
B:	184	0.080	0.0801	0.0001	0.0012
C:	184	0.016	0.0160	0.0000	0.0008
A+B:	184	0.240	0.2411	0.0011	0.0022
A-B:	184	0.080	0.0809	0.0009	0.0014
B+C:	184	0.096	0.0960	0.0000	0.0015
B-C:	184	0.064	0.0641	0.0001	0.0014

s.d.(AB)	S(between runs):	0.0013	Sw(within run):	0.0010	S/Sw: 1.3
s.d.(BC)	S(between runs):	0.0010	Sw(within run):	0.0010	S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.234	-	0.246	for	A+B
0.076	-	0.084	for	A-B
0.092	-	0.100	for	B+C
0.061	-	0.067	for	B-C

DUPLICATES:

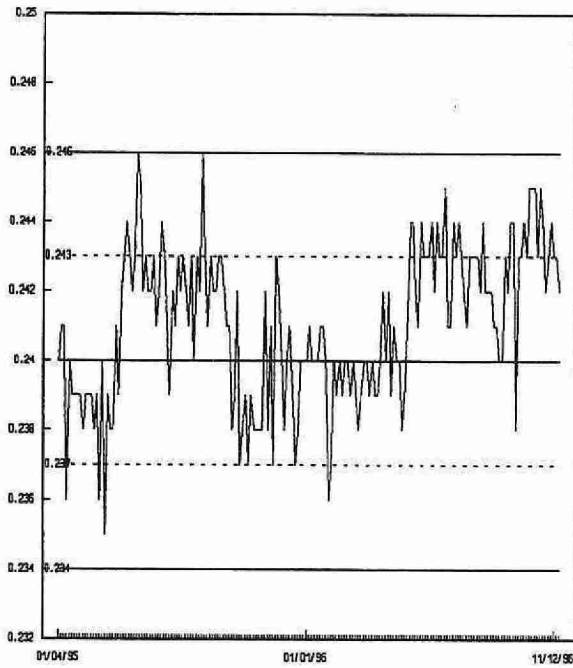
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
390	0.000 - 0.020	0.0013	30.0
47	0.021 - 0.040	0.0027	21.3
40	0.041 - 0.100	0.0042	7.5
10	0.101 - 0.200	0.0096	6.7
487	Overall	0.0016	

OTHER CHECKS:

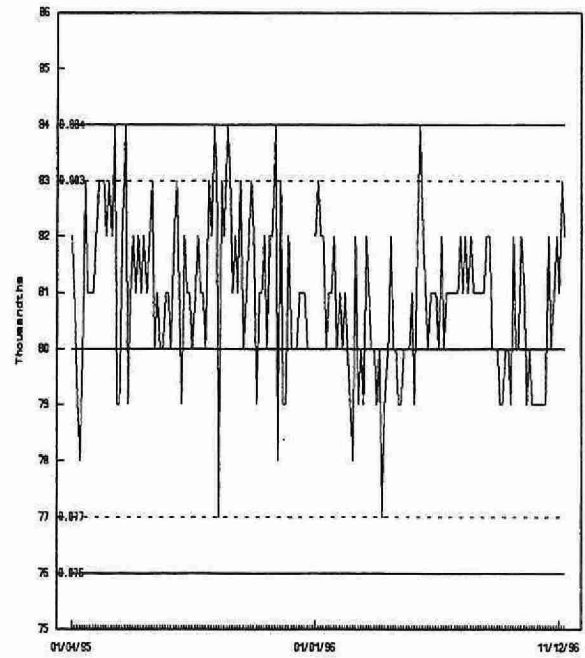
	n	Mean	Standard Deviation (1)
Long Term Blank	184	0.00014	0.0007

NITROGEN, NITRITE (mg/L as N)

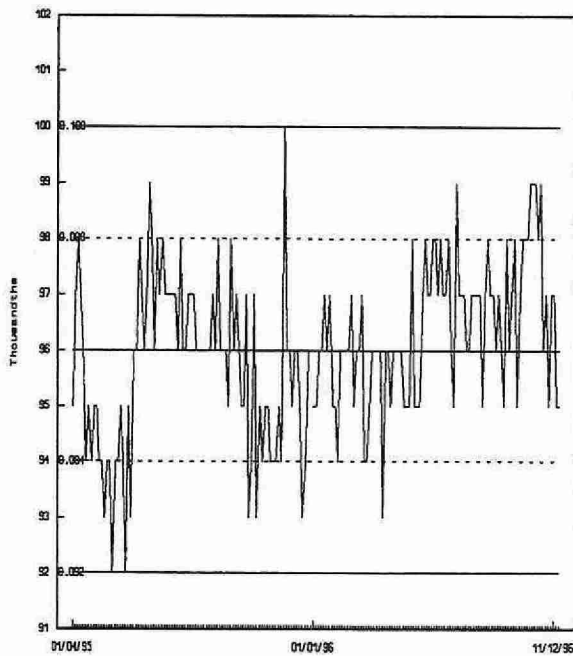
QUALITY CONTROL DATA FROM 04/01/95 TO 18/12/96



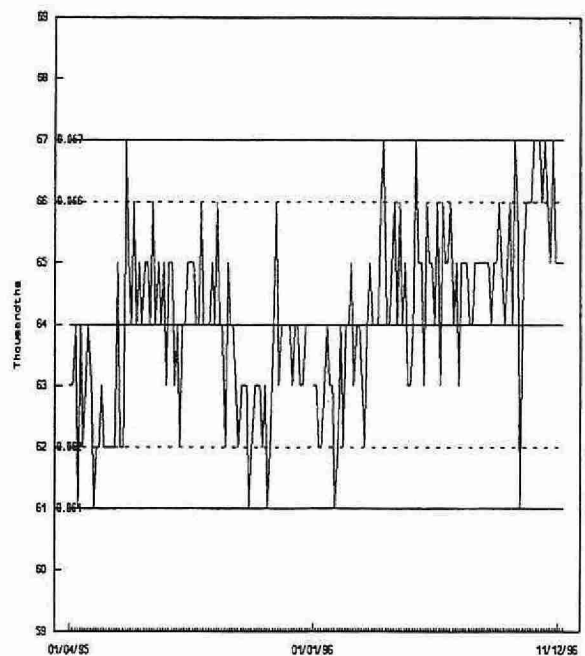
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

———— Control Limit
 - - - - - Warning Limit

NITROGEN, NITRITE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3366A	Units	mg/L as N
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Leachate, Domestic Waters		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrite is determined on the supernatant of a settled sample by formation of an azo dye using sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride.

Approximate absorbance: 0.3 at the full scale level.

Ammonia plus ammonium, nitrate plus nitrite, and reactive orthophosphate are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 520 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
--------------------------------	------------------------	------------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

NITROGEN, NITRITE

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96

Laboratory Unit: Colourimetry

Full Scale: to 2.00 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	144	1.60	1.604	0.004	0.0116
B:	144	0.80	0.8001	0.0001	0.0050
C:	144	0.160	0.1600	0.0000	0.0017
A+B:	144	2.40	2.404	0.004	0.0141
A-B:	144	0.80	0.804	0.004	0.0109
B+C:	144	0.960	0.9601	0.0001	0.0057
B-C:	144	0.640	0.6402	0.0002	0.0048

s.d.(AB)	S(between runs):	0.0089	Sw(within run):	0.0077	S/Sw: 1.2
s.d.(BC)	S(between runs):	0.0038	Sw(within run):	0.0034	S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.352	-	2.448	for	A+B
0.764	-	0.836	for	A-B
0.936	-	0.984	for	B+C
0.622	-	0.658	for	B-C

DUPLICATES:

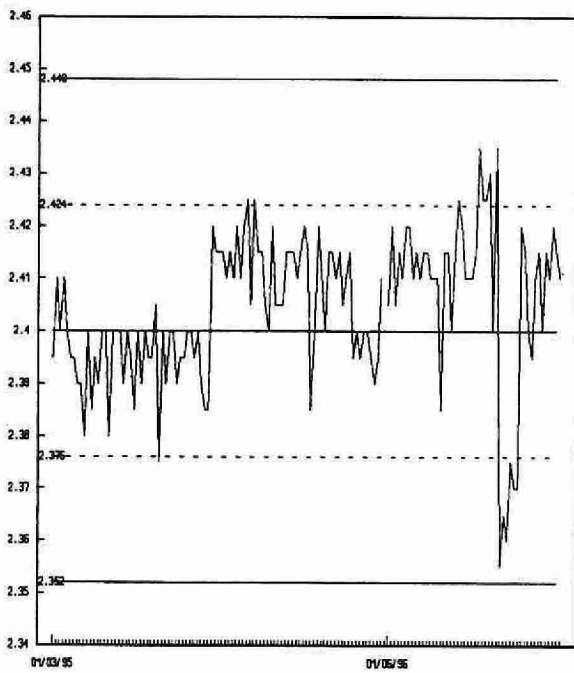
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
356	0.000 - 0.200	0.0111	40.1
21	0.201 - 0.400	0.0092	4.0
26	0.401 - 1.00	0.0430	10.0
22	1.01 - 2.00	0.0378	3.9
423	Overall	0.0230	

OTHER CHECKS:

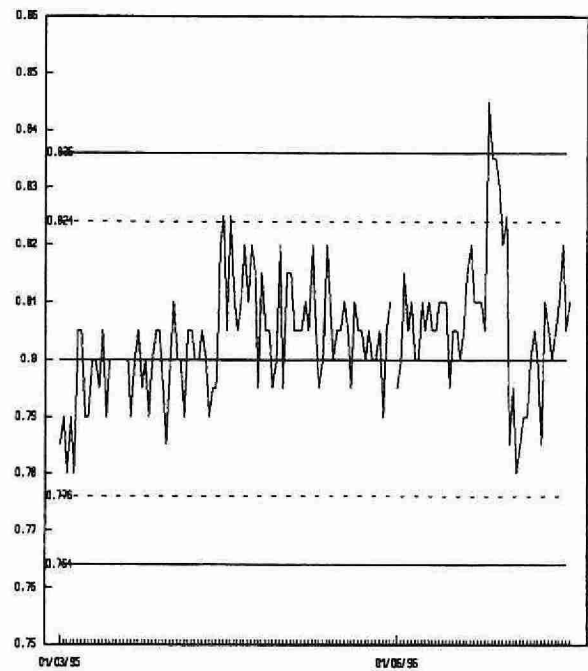
	n	Mean	Standard Deviation (1)
Long Term Blank	144	0.0002	0.0012

NITROGEN, NITRITE (mg/L as N)

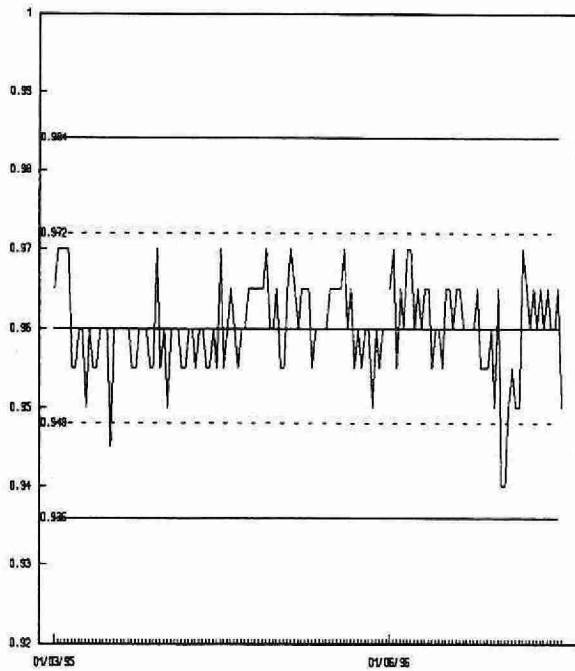
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96



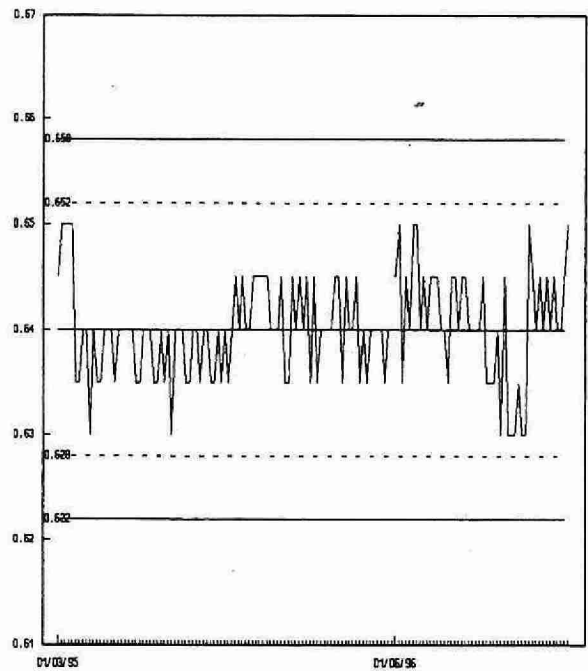
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 - - - - - Warning Limit

NITROGEN,TOTAL KJELDAHL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	Mar '89
Method Reference No	E3116A	Units	mg/g as N
LIMS Product Code	TNP3116	Supervisor	J. McBride
Sample Type/Matrix	Soil, Sediment and Sludge		

SAMPLING:

Quantity Required	0.08 to 0.4 g
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrogen compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

INSTRUMENTATION:

Hot plate .

Basic automated modular continuous flow system : 37.5°C bath. Colourimetric measurement is through a 5 cm. light path at 630 nm.

Data capture, and processing via a microcomputer system.

REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.1	Current T value: 0.5
---	----------------------	----------------------

CALIBRATION:

3 High and 2 Low Calibration Standards

CONTROLS:

Calibration	In house composite B-Soil/sediment, plus QC Soils/Sediment (RS92)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

NOTES:

System is calibrated with undigested standards.

NITROGEN, TOTAL KJELDAHL

QUALITY CONTROL DATA FROM 01/01/95 TO 01/12/96

Laboratory Unit: Colourimetry

Full Scale: 20 mg/g as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
RS92	90	1.69	1.52	-0.17	0.0794

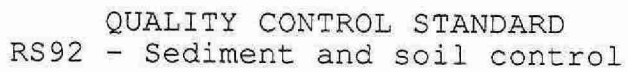
The calibration is accepted if the calibration control values obtained lie within the ranges:

1.39 - 1.99 for RS92

DUPLICATES: (Sediment/Soils)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
88	0.00 - 2.00	0.0498	4.7
49	2.01 - 4.00	0.1326	4.3
26	4.01 - 10.0	0.2482	4.2
8	10.1 - 20.0	0.6399	4.2
171	Overall	0.1102	

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



-172-

NITROGEN, TOTAL KJELDAHL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	Mar '89
Method Reference No	E3118A	Units	mg/g as N
LIMS Product Code	TNP3118	Supervisor	J. McBride
Sample Type/Matrix	Terrestrial and aquatic vegetation		

SAMPLING:

Quantity Required	0.02 to 0.04 g
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Nitrogen compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

INSTRUMENTATION:

Hot plate.

Basic automated modular continuous flow system : 37.5°C bath. Colourimetric measurement is through a 5 cm. light path at 630 nm.

Data capture, and processing via a microcomputer system.

REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.20	Current T value: 1.00
---	-----------------------	-----------------------

CALIBRATION:

3 High and 2 Low Calibration Standards

CONTROLS:

Calibration	In house composite A-VEG, plus QC VEG (Pine Needles)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

NOTES:

System is calibrated with undigested standards.

NITROGEN, TOTAL KJELDAHL

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96

Laboratory Unit: Colourimetry

Full Scale: 100 mg/g as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
Pine Needles (certified)	74	12.10	11.68	-0.42	0.7123

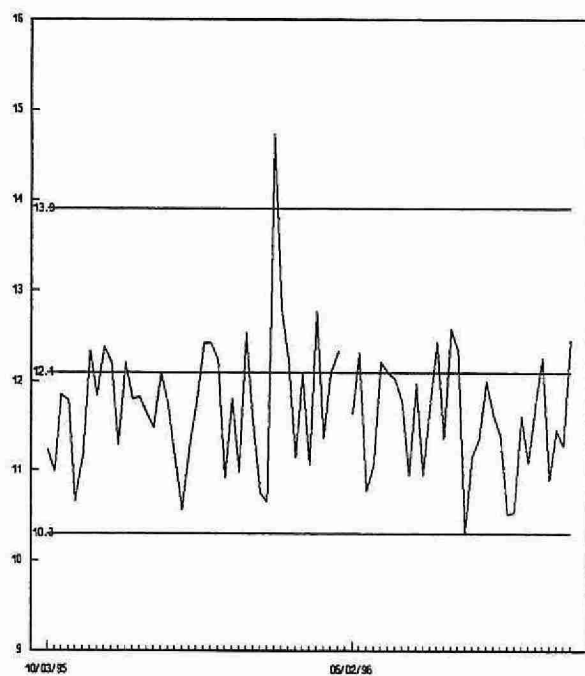
The calibration is accepted if the calibration control values obtained lie within the ranges:
10.3 - 13.9 for Pine Needles

DUPLICATES: (Vegetation)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
0	0.0 - 5.0	N.A.	N.A.
2	5.1 - 10.0	N.A.	N.A.
85	10.1 - 25.0	0.8025	3.8
64	25.1 - 50.0	0.8786	2.4
151	Overall	0.8297	

NITROGEN, TOTAL KJELDAHL (mg/g as N)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD
(Pine needle)

_____ Control Limit

NITROGEN, TOTAL KJELDAHL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3367A	Units	mg/L as N
LIMS Product Code	TOTNUT3367	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digestors kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line in two stages and then ammonia is determined by formation of indophenol blue in a buffered system using nitroprusside as a catalyst.

Approximate absorbance: 0.3 at the full scale level.

Total phosphorus is determined simultaneously.

INSTRUMENTATION:

Three block digesters

Basic automated modular continuous flow system plus 1 module: 38°C bath (7.7 mL delay). Colourimetric measurement is through a 5.0 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
--------------------------------	-----------------------	----------------------

CALIBRATION:

BL plus 7 undigested standards

CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

NITROGEN, TOTAL KJELDAHL

QUALITY CONTROL DATA FROM 05/01/95 TO 19/12/96

Laboratory Unit: Colourimetry

Full Scale: to 2.00 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	236	1.60	1.608	0.008	0.0136
B:	236	0.800	0.800	0.000	0.0101
C:	236	0.160	0.1604	0.0004	0.0073
A+B:	236	2.40	2.408	0.008	0.0197
A-B:	236	0.800	0.808	0.008	0.0136
B+C:	236	0.960	0.9604	0.0004	0.0140
B-C:	236	0.640	0.639	-0.001	0.0107

s.d.(AB)	S(between runs):	0.012	Sw(within run):	0.0096	S/Sw: 1.2
s.d.(BC)	S(between runs):	0.0088	Sw(within run):	0.0075	S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.32	-	2.48	for	A+B
0.740	-	0.860	for	A-B
0.913	-	1.007	for	B+C
0.605	-	0.675	for	B-C

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
236	1.40	1.392	0.0517
236	0.840	0.832	0.0454
236	0.280	0.279	0.0211

DUPLICATES:

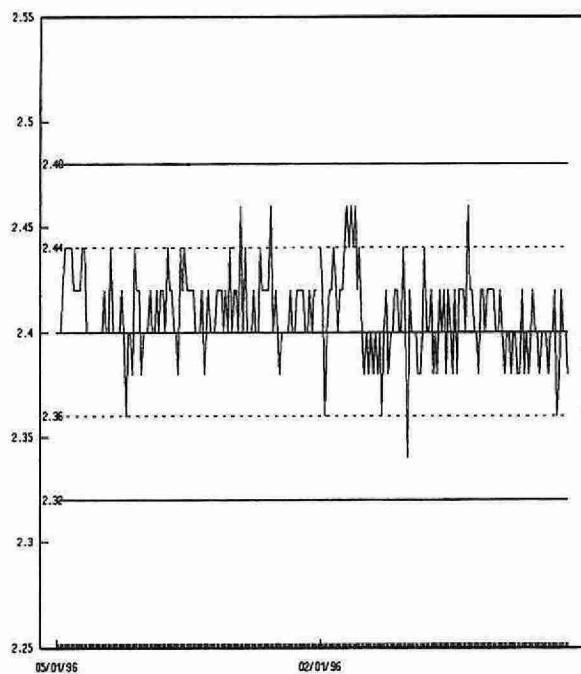
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
130	0.000 - 0.200	0.0178	14.6
264	0.201 - 0.400	0.0190	7.5
251	0.401 - 1.00	0.0306	7.6
46	1.01 - 2.00	0.0578	5.2
691	Overall	0.0247	

OTHER CHECKS:

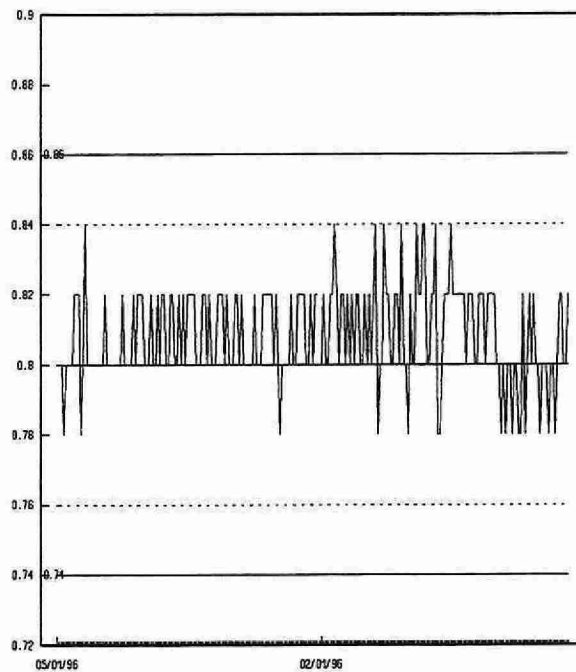
	n	Mean	Standard Deviation (1)
Long Term Blank	236	-0.0008	0.0066
Digested Blank	236	0.0217	0.0135

NITROGEN, TOTAL KJELDAHL (mg/L as N)

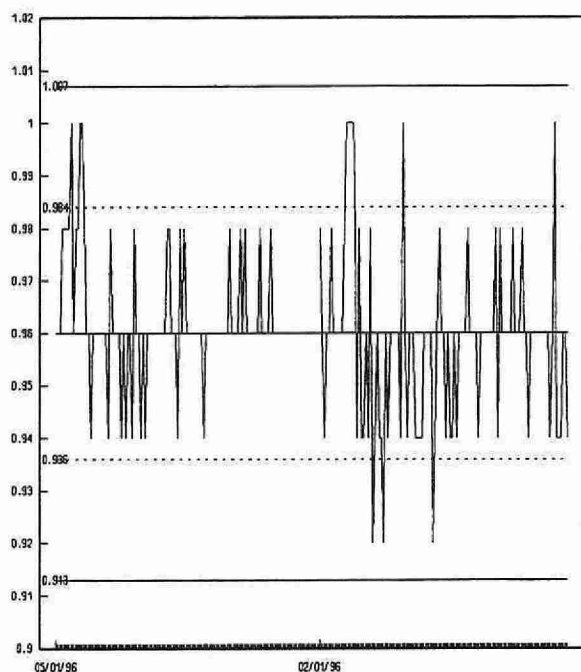
QUALITY CONTROL DATA FROM 05/01/95 TO 19/12/96



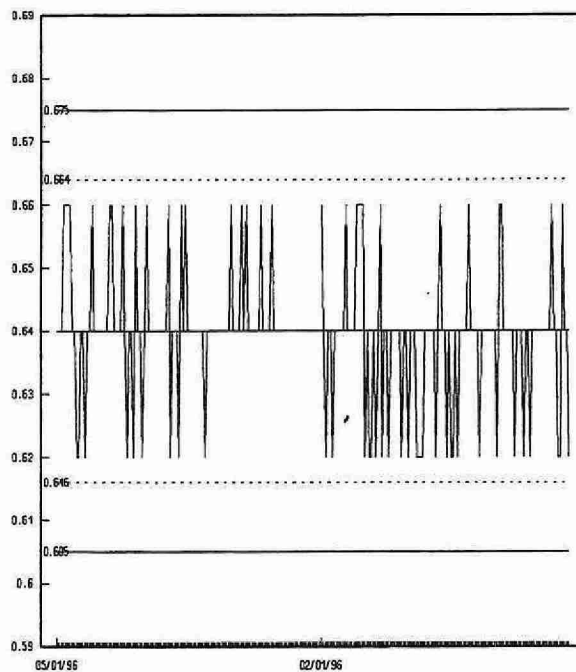
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 - - - - - Warning Limit

NITROGEN, TOTAL KJELDAHL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3368A	Units	mg/L as N
LIMS Product Code	TOTNUT3368	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Domestic Waters, Effluents, Leachates		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digestors kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line in two stages and then ammonia is determined by formation of indophenol blue in a buffered system using nitroprusside as a catalyst.

Approximate absorbance: 1.1 at the full scale level.

Total phosphorus is determined simultaneously.

INSTRUMENTATION:

Three block digesters

Basic automated modular continuous flow system plus 1 module: 38°C bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 undigested standards

CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

NOTES:

System is calibrated with undigested standards.

NITROGEN, TOTAL KJELDAHL

QUALITY CONTROL DATA FROM 05/01/95 TO 19/12/96

Laboratory Unit: Colourimetry

Full Scale: to 50.0 mg/L as N

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	132	40.0	40.008	0.008	0.1734
B:	132	20.0	20.008	0.008	0.1001
C:	132	4.0	4.001	0.001	0.0674
A+B:	132	60.0	60.016	0.016	0.2111
A-B:	132	20.0	20.001	0.001	0.1888
B+C:	132	24.0	24.008	0.008	0.1445
B-C:	132	16.0	16.007	0.007	0.0908

s.d.(AB)	S(between runs):	0.145	Sw(within run):	0.133	S/Sw: 1.1
s.d.(BC)	S(between runs):	0.085	Sw(within run):	0.064	S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

59.27	-	60.73	for	A+B
19.45	-	20.55	for	A-B
23.58	-	24.42	for	B+C
15.68	-	16.32	for	B-C

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
132	35	34.9	0.5407
132	21	20.5	0.3601
132	7	6.8	0.1578

DUPLICATES:

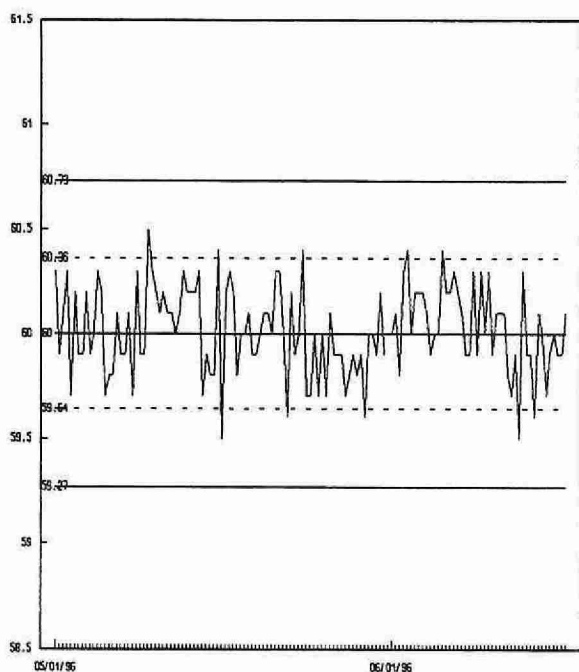
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
284	0.00 - 5.00	0.0869	15.4
35	5.01 - 10.0	0.1938	2.8
46	10.1 - 25.0	0.3796	2.3
21	25.1 - 50.0	0.5961	17
386	Overall	0.1399	

OTHER CHECKS:

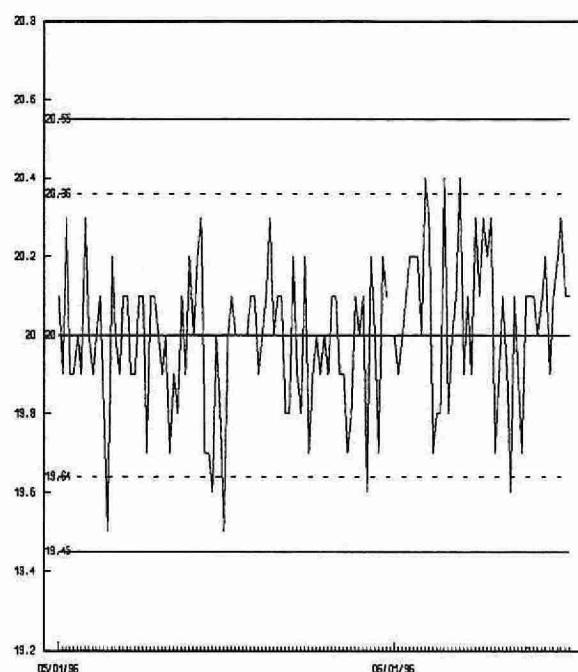
	n	Mean	Standard Deviation (1)
Long Term Blank	132	0.006	0.0341
Digested Blank	132	0.016	0.0567

NITROGEN, TOTAL KJELDAHL (mg/L as N)

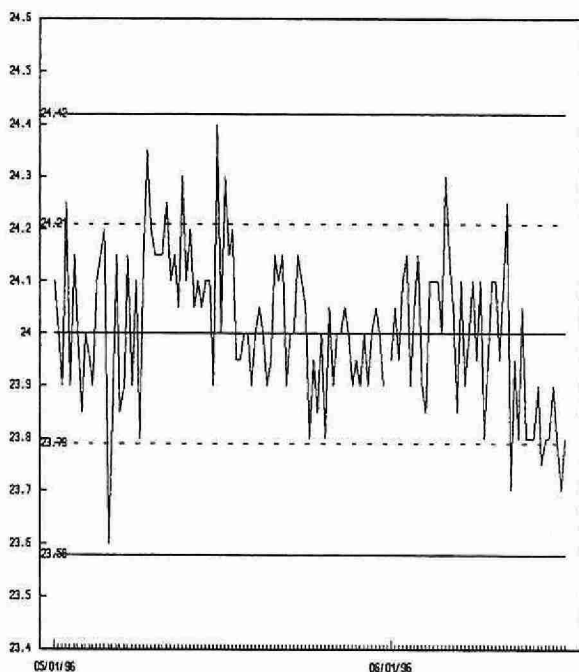
QUALITY CONTROL DATA FROM 05/01/95 TO 19/12/96



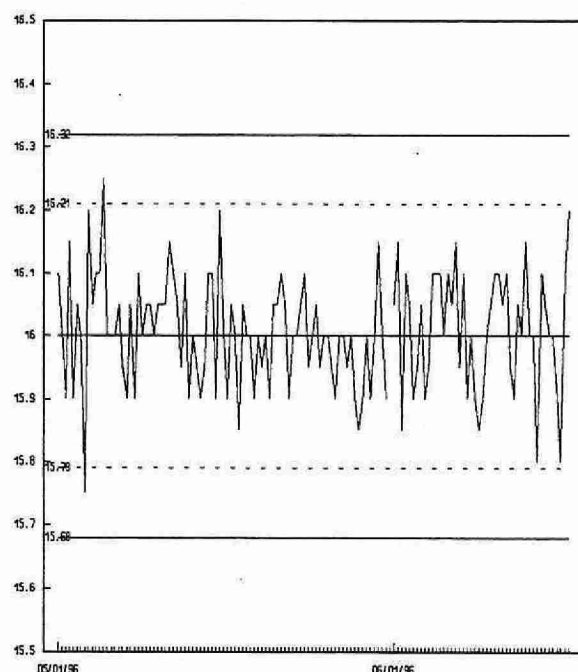
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

OXYGEN DEMAND, BIOCHEMICAL

IDENTIFICATION:

Laboratory Unit:	BOD	Method Introduced:	Before '61
Method Reference No:	E3182A	Units:	mg/L as O
LIMS Product Code:	BOD3182	Supervisor:	J. McBride
Sample Type/Matrix:	Sewage, Industrial Waste, Effluents, Domestic Waters, Leachates		

SAMPLING:

Quantity Required:	400 mL
Container:	Glass or plastic

SAMPLE PREPARATION:

If necessary sample pH is adjusted to neutral and chlorine is removed by reaction with sodium sulphite.

ANALYTICAL PROCEDURE:

Oxygen depletion is measured as the difference in dissolved oxygen (DO) concentration. DO readings are taken prior to sample storage, and also at the end of storage in the dark at 20°C for five days (BOD₅). If necessary, dilutions are made with aerated, nutrient-enriched water to obtain a 25-75% oxygen depletion. If the sample has undergone any of the sample preparation steps listed above or if the sample is an industrial waste, a sewage seed is added. For such samples, calculation of an appropriate seed correction is required.

INSTRUMENTATION:

- YSI Model 59 DO meter (Yellow Springs Instrument Company) with DO probe equipped with stirrer and fitted with a Teflon membrane of 0.5 mil thickness which is permeable to oxygen (1 mil = 0.001 inch).
- Titration equipment for Winkler analysis of dissolved oxygen.
- Incubator (19-21°C); BOD bottles (300 mL)

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION (DO):

The standard is air-saturated reversed osmosis deionized water. The DO content is read from a table (ORBISPHERE LABORATORIES - Pressure temperature dissolved oxygen table) after measuring its temperature and the barometric pressure in the laboratory.

OXYGEN DEMAND, BIOCHEMICAL cont'd

CONTROLS:

Calibration (DO)	2 QC solutions of Pure-DW water which have been partially stripped of DO by flushing with nitrogen. These "solutions", of different but unknown DO, are compared using the Oxygen meter and the Winkler titration procedure. The difference between the values for the two analytical methods is utilized as a slope control for the DO Analyzer.
Recovery (BOD5)*	3 Recovery standards prepared from a combination of Glucose and Glutamic Acid e.g. R1; the expected BOD5 is 67% of the oxygen requirement for complete oxidation.
Drift	Air saturated Pure-DW water after every 24 samples.
Blanks*	Pure-DW water and BOD dilution water

NOTES:

* These solutions are incubated for five days alongside samples.

OXYGEN DEMAND, BIOCHEMICAL

QUALITY CONTROL DATA FROM 04/01/954 TO 24/12/96

Laboratory Unit: BOD

Full Scale: to 9.0 mg/L as O at 20°C

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	216	0.00	0.018	0.018	0.0885
B:	216	0.00	0.021	0.021	0.0817

On any given day the calibration is accepted if the values obtained lie within the ranges:

-0.25 - 0.25

RECOVERIES:

Number of Data	Expected Depletion	Mean Depletion	Standard Deviation (1)
105	2.20	2.12	0.1925
105	4.34	4.24	0.2820
105	6.52	6.35	0.3380

DUPLICATES:

n Data Pairs	Sample Depletion Span	Standard Deviation (2)	Coefficient of variation(%)
96	0.0 - 1.8	0.1039	10.7
122	1.9 - 4.5	0.1492	6.4
54	4.6 - 9.0	0.2462	4.6
272	Overall	0.1458	

OTHER CHECKS:

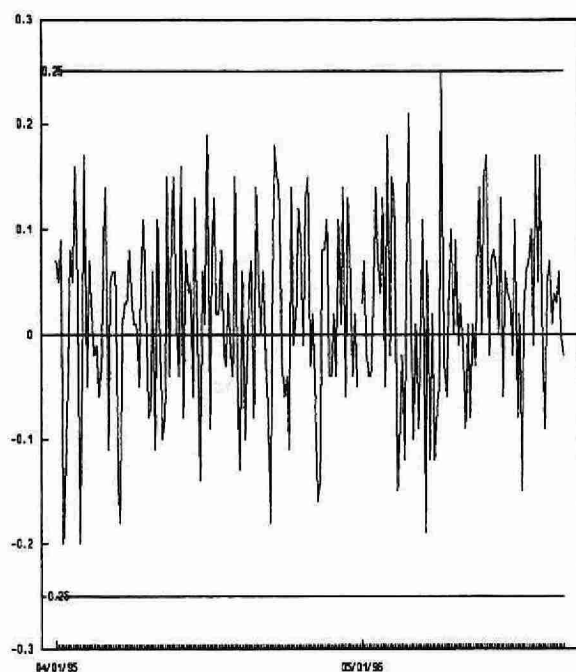
	n	Mean	Standard Deviation (1)
5 Day Pure-DW Blank	106	0.105	0.0939
5 Day BOD Blank	106	0.110	0.0939

NOTES:

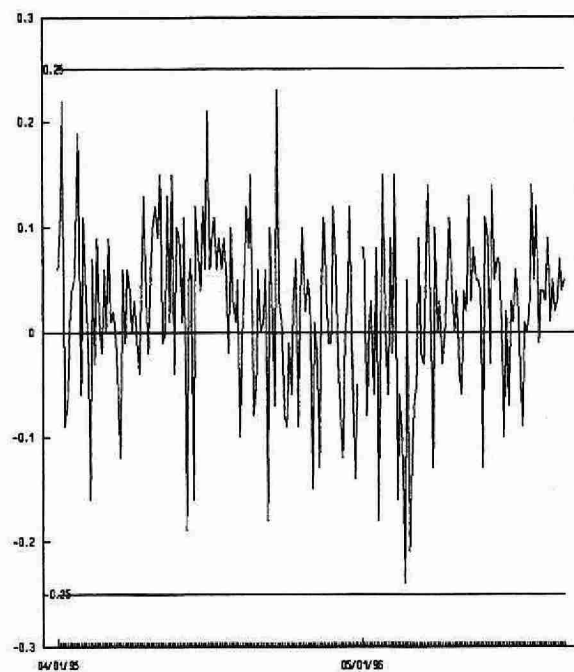
The final concentration of BOD in mg/L as O is determined by the oxygen depletion after 5 days at 20°C multiplied by a dilution and seed correction factor.

OXYGEN DEMAND, BIOCHEMICAL (mg/L as O)

QUALITY CONTROL DATA FROM 04/01/95 TO 24/12/96



QUALITY CONTROL STANDARD A



QUALITY CONTROL STANDARD B

CONTROL LIMIT

OXYGEN DEMAND, CHEMICAL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/07/82
Method Reference No	E3170A	Units	mg/L as O
LIMS Product Code	COD3170	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents		

SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are mixed with an acidified potassium dichromate solution which contains mercuric sulphate to suppress chloride interference. After adding concentrated sulphuric acid containing silver sulphate as a catalyst, the mixture is digested in a mechanical-convection oven for 3 hours at 149°C. Analysis is completed by automated colourimetric measurement of trivalent chromium.

Approximate absorbance: 0.05 at the full scale level.

INSTRUMENTATION:

- Culture tubes with Teflon closures; mechanical-convection oven
- Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 600 nm.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
--------------------------------	--------------------	--------------------

CALIBRATION:

3 digested BL plus 3 digested standards

CONTROLS:

Calibration	2 digested standards, e.g. QCA
Drift	Undigested BL every 10 samples; standard plus BL at end of run
Recovery	2 digested standards, e.g. R1
Interference	Digested standard (40 mg/L as O) spiked with 50 mg/L Cl confirms suppression of chloride interference.

NOTES:

In order to retard sample decomposition the first reagent (acidified dichromate) is added as soon as possible at the laboratory. Analysis is scheduled for completion within the week. The recovery standard is a material known to be very difficult to digest. The expected recovery is approximately 85%, based on long term experience. We continue to use this material in spite of the poor recovery, because if the slightest problem exists with the digestion step, the recovery falls off sharply to approximately 10%.

OXYGEN DEMAND, CHEMICAL

QUALITY CONTROL DATA FROM 07/01/95 TO 13/12/96

Laboratory Unit: Colourimetry

Full Scale: to 40.0 mg/L as O

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	63	40.0	39.81	-0.19	1.4421
B:	63	10.0	9.85	-0.15	1.3424
A+B:	63	50.0	49.70	-0.30	1.8972
A-B:	63	30.0	29.98	-0.02	2.0403

s.d.(AB) S(between runs): 1.39 Sw(within run): 1.44 S/Sw: 0.96

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

46.3 - 53.7 for A+B
27.2 - 32.8 for A-B

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
63	39	37.6	3.098
63	9.8	9.46	1.554

DUPLICATES:

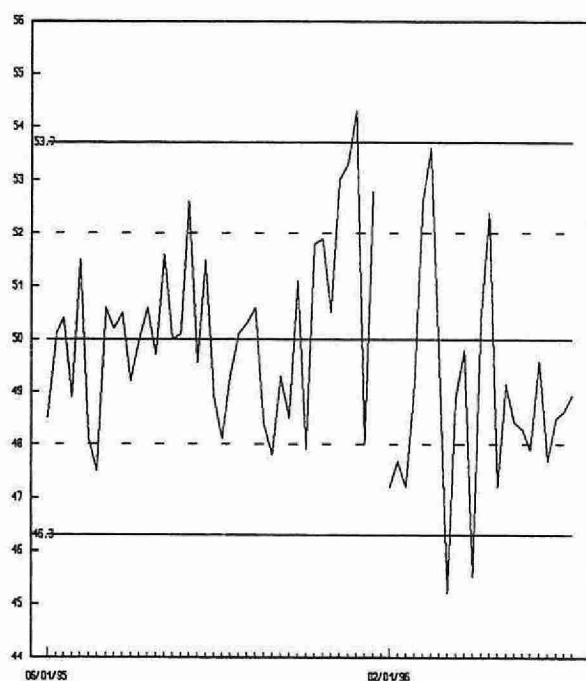
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
28	0 - 8	2.0598	35.3
74	9 - 20	2.2419	15.3
45	21 - 40	2.0929	7.6
147	Overall	2.1555	

OTHER CHECKS:

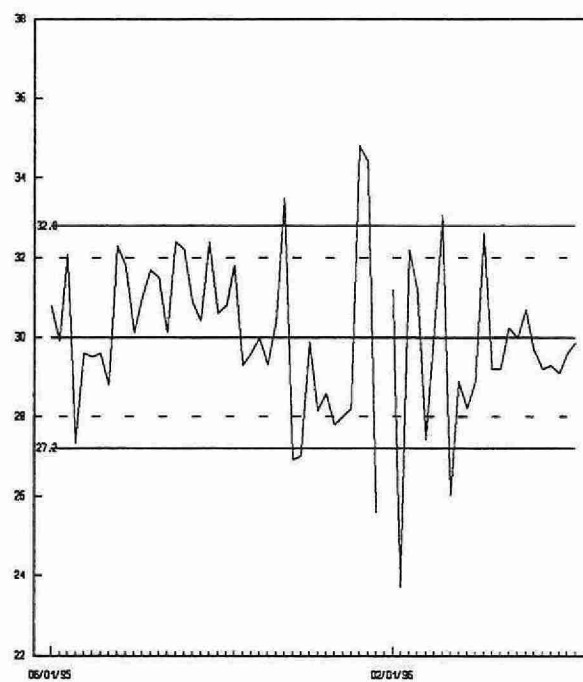
	n	Mean	Standard Deviation (1)
Chloride Check	63	38.9	2.7153

OXYGEN DEMAND, CHEMICAL (mg/L as O)

QUALITY CONTROL DATA FROM 07/01/95 TO 13/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

OXYGEN DEMAND, CHEMICAL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/07/82
Method Reference No	E3246A	Units	mg/L as O
LIMS Product Code	COD3246	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Domestic Waters, Leachates, Effluents		

SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples (10.0 mL) are mixed with an acidified potassium dichromate solution which contains mercuric sulphate to suppress chloride interference. After adding concentrated sulphuric acid containing silver sulphate as a catalyst, the mixture is digested in a mechanical-convection oven for 3 hours at 149°C. Analysis is completed by automated colourimetric measurement of trivalent chromium.

Approximate absorbance: 0.6 at the full scale level.

INSTRUMENTATION:

-Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 600 nm.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
--------------------------------	--------------------	---------------------

CALIBRATION:

2 digested BL plus 4 digested standards

CONTROLS:

Calibration	2 digested standards, e.g. QCA
Drift	Undigested BL every 10 samples; standard plus BL at end of run
Recovery	2 digested standards, e.g. R1
Interference	Digested standard (50 mg/L as O) spiked with 900 mg/L Cl confirms suppression of chloride interference.

NOTES:

In order to retard sample decomposition the first reagent (acidified dichromate) is added as soon as possible at the laboratory. Analysis is scheduled for completion within the week. The recovery standard is a material known to be very difficult to digest. The expected recovery is approximately 85%, based on long term experience. We continue to use this material in spite of the poor recovery, because if the slightest problem exists with the digestion step, the recovery falls off sharply to approximately 10%.

OXYGEN DEMAND, CHEMICAL

QUALITY CONTROL DATA FROM 17/01/95 TO 13/12/96

Laboratory Unit: Colourimetry

Full Scale: to 500.0 mg/L as O

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	68	400	399.5	-0.5	6.1947
B:	68	100	101.7	1.7	5.8176
A+B:	68	500	501.2	1.2	8.1456
A-B:	68	300	297.7	-2.3	8.8361

s.d.(AB)

S(between runs):

6.0

Sw(within run):

6.2

S/Sw: 0.96

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

477.5 - 522.5 for A+B

285.0 - 315.0 for A-B

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
67	390	386.3	11.0926
67	98	99.3	6.5962

DUPLICATES:

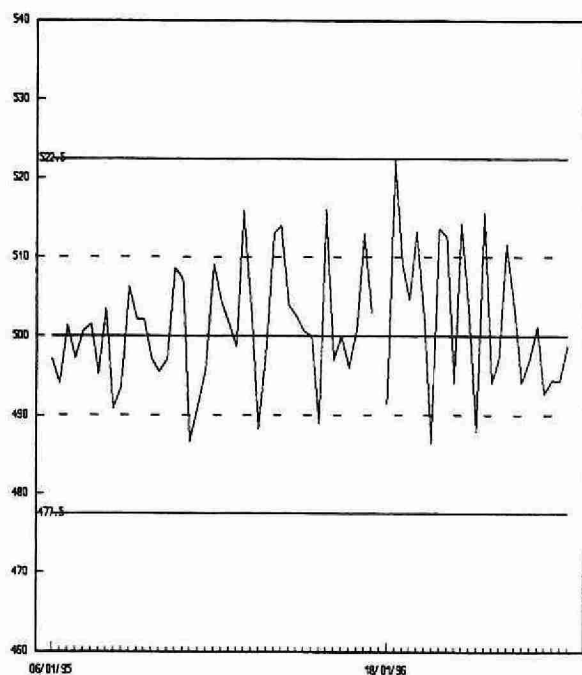
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
78	0 - 50	4.1050	19.0
24	51 - 100	3.2460	4.9
19	101 - 250	4.3993	2.9
15	251 - 500	6.0591	1.6
136	Overall	4.2649	

OTHER CHECKS:

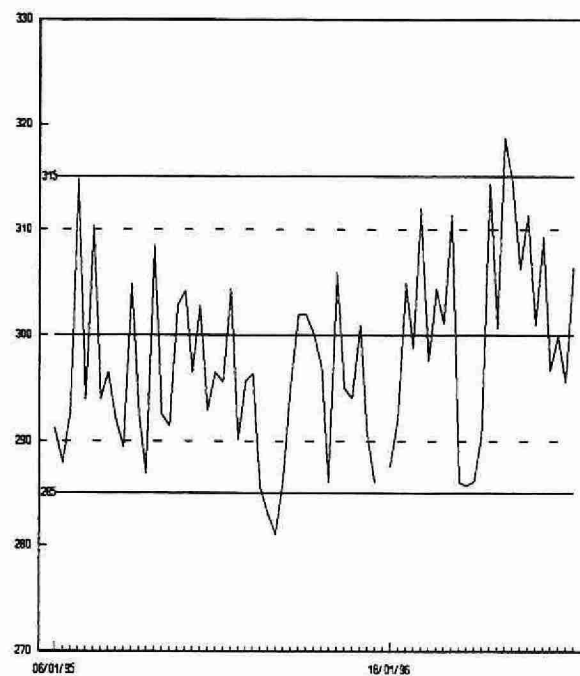
	n	Mean	Standard Deviation (1)
Chloride Check	67	50.6	9.7254

OXYGEN DEMAND, CHEMICAL (mg/L as O)

QUALITY CONTROL DATA FROM 17/01/95 TO 13/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

pH

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/01/76
Method Reference No.	E3042A	Units	dimensionless
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, and Groundwaters		

SAMPLING:

Quantity Required:	150 mL
Container:	250 mL Amber polyethylene or BOD bottle filled to the brim; screw caps with cone-shaped liners are preferred.

ANALYTICAL PROCEDURE:

pH is measured directly on a stirred sample (100 mL) at room temperature. Stirring rate, beaker size, degree of electrode immersion and room temperature range are uniform for all samples and standards.

Alkalinity (Gran) is performed simultaneously.

INSTRUMENTATION:

Digital pH meter, stirrer, combined glass electrode.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

CONTROLS:

Calibration	BL plus 2 standards, e.g. QCA
Drift	2 standard buffers - 2 times daily

pH

QUALITY CONTROL DATA FROM 04/01/95 TO 19/12/96

Laboratory : Dorset

Analytical Range: to 14.00 Dimensionless

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	216	6.86	6.867	0.007	0.0132
B:	216	4.01	4.012	0.002	0.0170
A+B:	216	10.87	10.879	0.009	0.0234
A-B:	216	2.85	2.855	0.005	0.0194

s.d.(AB)

S(between runs): 0.015

Sw:(within run): 0.014

S/Sw: 1.1

On any given day the calibration is accepted if the values obtained lie within the ranges:

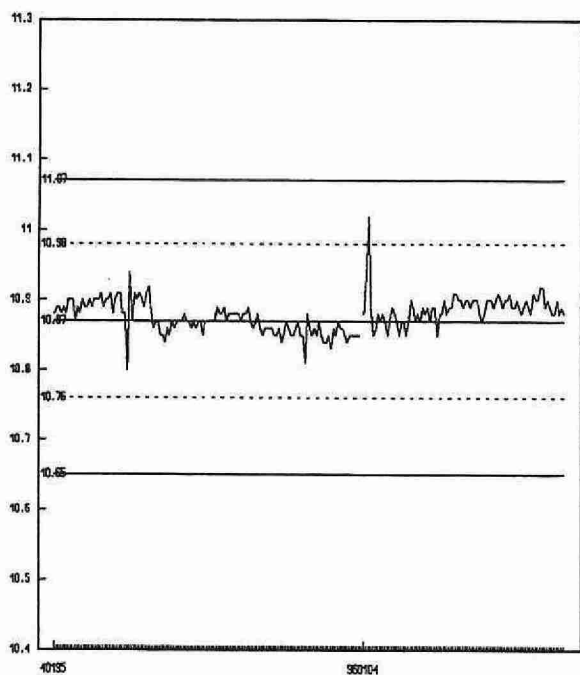
10.65 - 11.07 for A+B
2.72 - 3.00 for A-B

DUPLICATES:

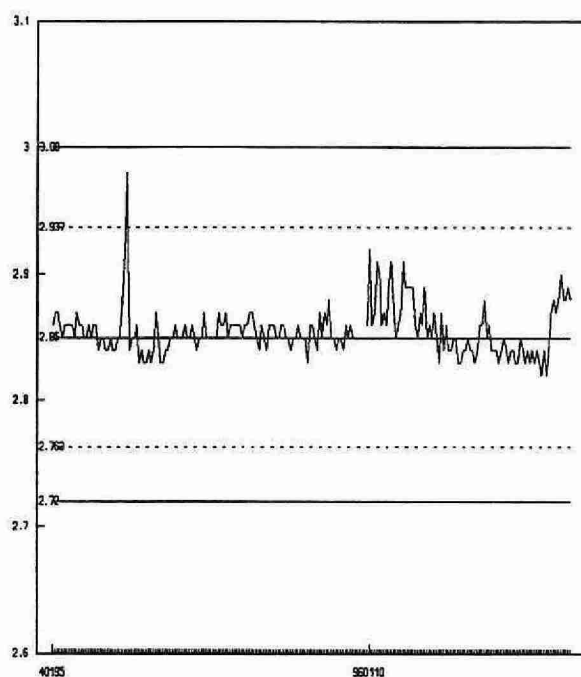
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
149	3.5 - 5.00	0.0139	0.4
151	5.01 - 6.00	0.0282	1.0
199	6.01 - 7.00	0.0313	1.1
131	7.01 - 9.00	0.0282	0.9
630	Overall	0.0262	

pH

QUALITY CONTROL DATA FROM 04/01/95 TO 19/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
 ----- Warning Limit

pH

IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	09/07/80
Method Reference No	E3218A	Units	Dimensionless
LIMS Product Code	PHALCO3218, CONDPH3218	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Sewage, Effluents		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (10.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards.
Total fixed endpoint alkalinity, and conductivity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	2 QC standards e.g. QCA
Drift	In run standards throughout the run (diluted tap water 50% V/V)

pH

QUALITY CONTROL DATA FROM 05/01/95 TO 24/12/96

Laboratory Unit: Titration

Analytical Range: to 14.00 Dimensionless

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	195	7.41	7.43	0.02	0.0272
B:	195	4.45	4.48	0.03	0.0627
A+B:	195	11.86	11.91	0.05	0.0681
A-B:	195	2.96	2.94	-0.02	0.0686

s.d.(AB) S(between runs): 0.048 Sw(within run): 0.048 S/Sw: 1.0

On any given day the calibration is accepted if the values obtained lie within the ranges:

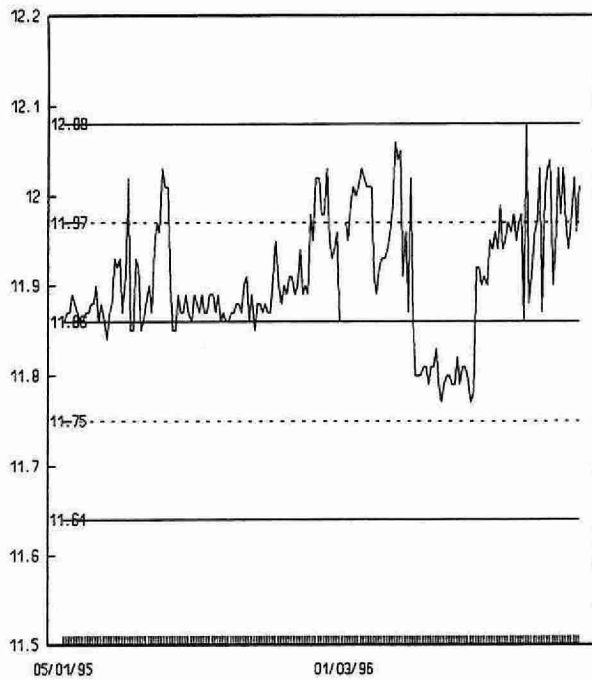
11.64 - 12.08 for A+B
2.79 - 3.13 for A-B

DUPLICATES:

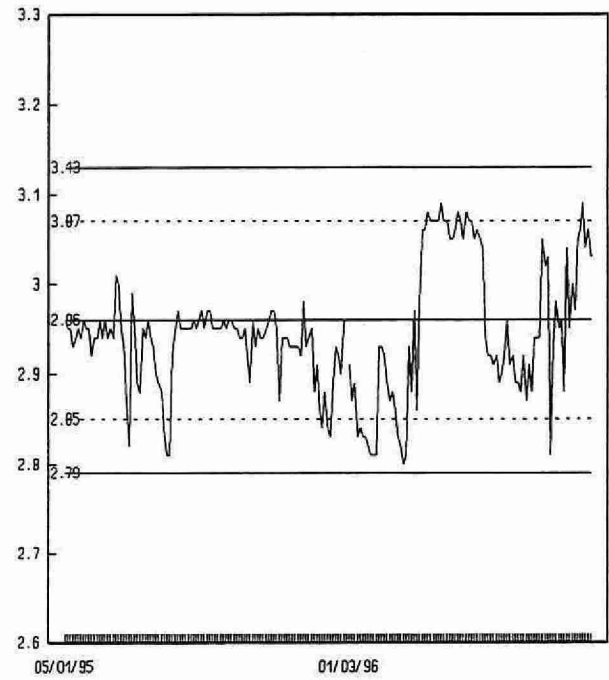
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
41	1.00 - 7.00	0.0998	2.0
274	7.01 - 8.00	0.1148	4.7
138	8.01 - 12.00	0.0648	1.0
453	Overall	0.0964	

pH

QUALITY CONTROL DATA FROM 05/01/95 TO 24/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

pH

IDENTIFICATION:

Laboratory Unit	MISA	Method Introduced	01/05/79
Method Reference No	E3248A	Units	Dimensionless
LIMS Product Code	PHACD3248, PH3248	Supervisor	J McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (15.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards.

Total fixed endpoint acidity and Gran acidity can be determined simultaneously if the sample volume exceeds 50 mL.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
-------------	---------------------------------

NOTES:

A new automated system was introduced in Sept' 96.

pH

QUALITY CONTROL DATA FROM 13/09/96 TO 20/10/96

Laboratory Unit: Titration

Analytical Range: to 14.00 Dimensionless

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	17	4.45	4.369	-0.081	0.0458
B:	17	3.75	3.686	-0.064	0.0545
A+B:	17	8.20	8.055	-0.145	0.0973
A-B:	17	0.70	0.682	0.018	0.0259

s.d.(AB)

S(between runs): 0.050

S/Sw:(within run): 0.018

S/Sw: 2.8

On any given day the calibration is accepted if the values obtained lie within the ranges:

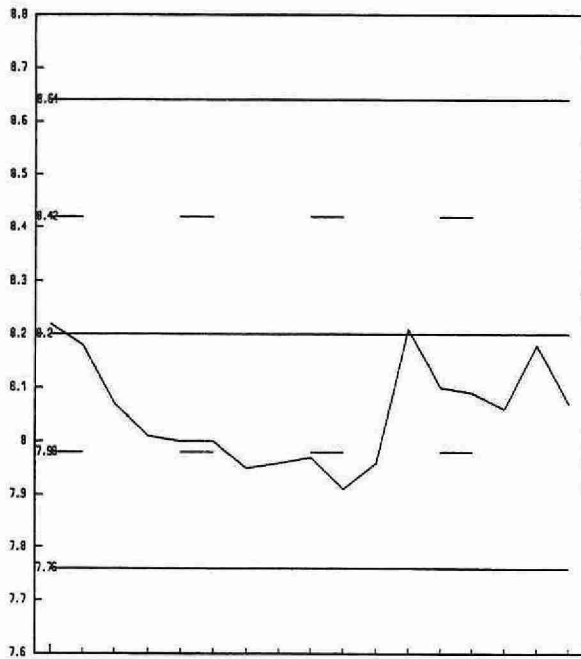
7.76 - 8.64 for A+B
0.37 - 1.03 for A-B

DUPLICATES:

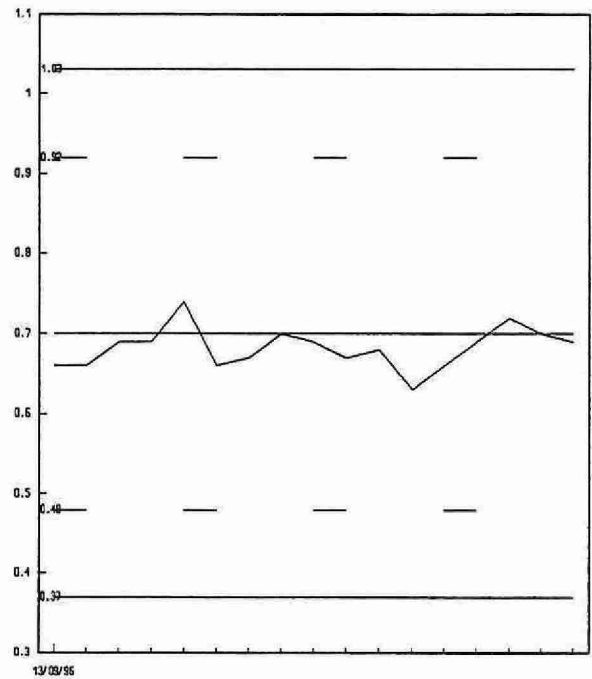
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
24	3.00 - 5.00	0.0111	0.2
3	5.01 - 8.50	0.0113	0.2
0	8.51 - 14.0	N.A.	N.A.
27	Overall	0.0112	

pH

QUALITY CONTROL DATA FROM 13/09/96 TO 20/10/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

pH

IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	09/07/80
Method Reference No	E3289A	Units	Dimensionless
LIMS Product Code	PHALCO3289, CONDPH3289	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes		

SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (10.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards.

Total fixed endpoint alkalinity, and conductivity are determined simultaneously.

INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

REPORTING:

Maximum Significant Figures: 3

CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

CONTROLS:

Calibration	2 QC standards e.g. QCA
Drift	In run standards throughout the run (diluted tap water 20% V/V)

pH

QUALITY CONTROL DATA FROM 03/01/95 TO 24/12/96

Laboratory Unit: Titration

Analytical Range: to 14.00 Dimensionless

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	154	7.41	7.41	0.00	0.0252
B:	154	4.45	4.49	0.05	0.0655
A+B:	154	11.86	11.91	0.05	0.0749
A-B:	154	2.96	2.92	-0.04	0.0651

s.d.(AB)

S(between runs): 0.05

S/Sw:(within run): 0.05

S/Sw: 1.0

On any given day the calibration is accepted if the values obtained lie within the ranges:

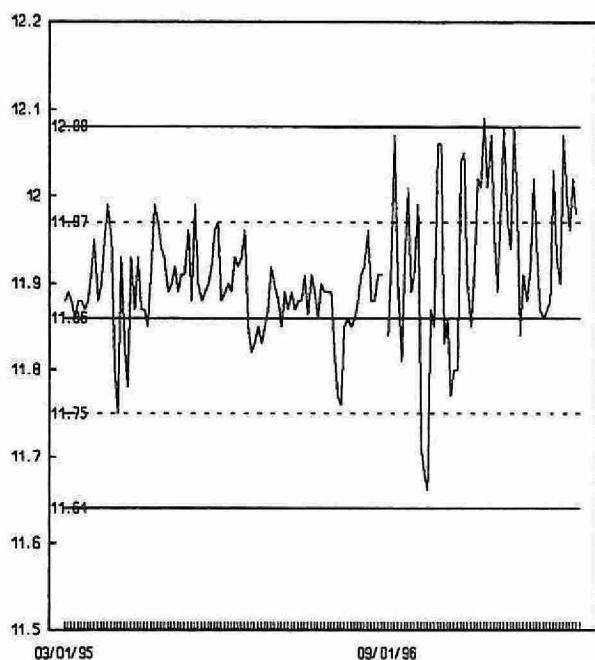
11.64 - 12.08 for A+B
2.79 - 3.13 for A-B

DUPLICATES:

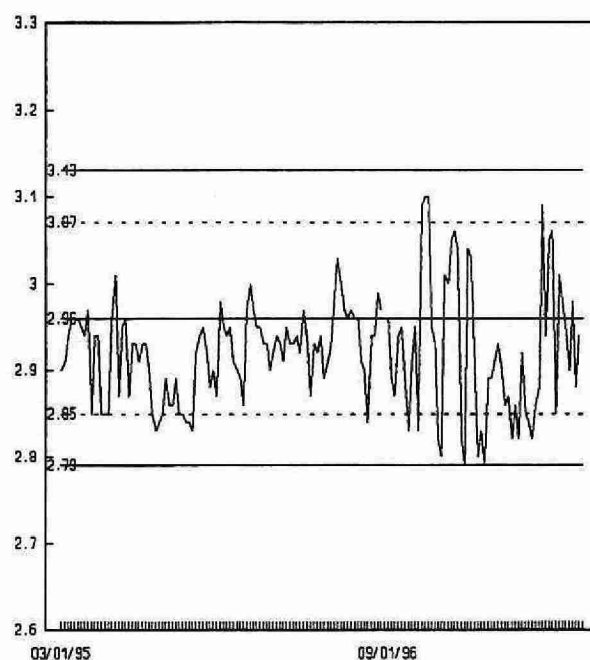
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
33	4.00 - 7.50	0.0938	1.7
94	7.51 - 8.00	0.1114	1.5
280	8.01 - 9.00	0.0703	0.8
1	9.01 - 9.50	N.A.	
408	Overall	0.0810	

pH

QUALITY CONTROL DATA FROM 03/01/95 TO 24/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
 ----- Warning Limit

PHENOLICS, REACTIVE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/74
Method Reference No	E3179A	Units	µg/L as Phenol
LIMS Product Code	PHEN3179	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Water Supplies, Leachates, Sewage, Industrial Wastes		

SAMPLING:

Quantity Required	250 mL
Container	Glass, (Phenol bottle with white cap containing preservative is available)
Preservative	Sulfuric acid to pH 1.5 - 2

ANALYTICAL PROCEDURE:

Samples are automatically distilled from an acid media, and reactive phenolics in the distillate are determined colourimetrically by formation of an antipyrene dye through reactions with 4-aminoantipyrene and potassium ferricyanide. Approximate absorbance: 0.03 at the full scale level.

INSTRUMENTATION:

Basic automated modular continuous flow system plus a distillation module. Colourimetric measurement is through a 5.0 cm. light path at 505 nm.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
--------------------------------	----------------------	--------------------

CALIBRATION:

BL plus 2 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	BL, standard, BL every 10 samples

PHENOLICS, REACTIVE

QUALITY CONTROL DATA FROM 06/01/95 TO 20/12/96

Laboratory Unit: Colourimetry

Full Scale: to 50.0 µg/L as Phenol

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	105	40	40.12	0.12	0.6586
B:	105	10	10.18	0.18	0.2255
A+B:	105	50	50.59	0.59	0.7190
A-B:	105	30	30.18	0.18	0.6736

s.d.(AB) S(between runs): 0.49

Sw(within run): 0.48

S/Sw: 1.03

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

47.8 - 52.2 for A+B
28.5 - 31.5 for A-B

DUPLICATES:

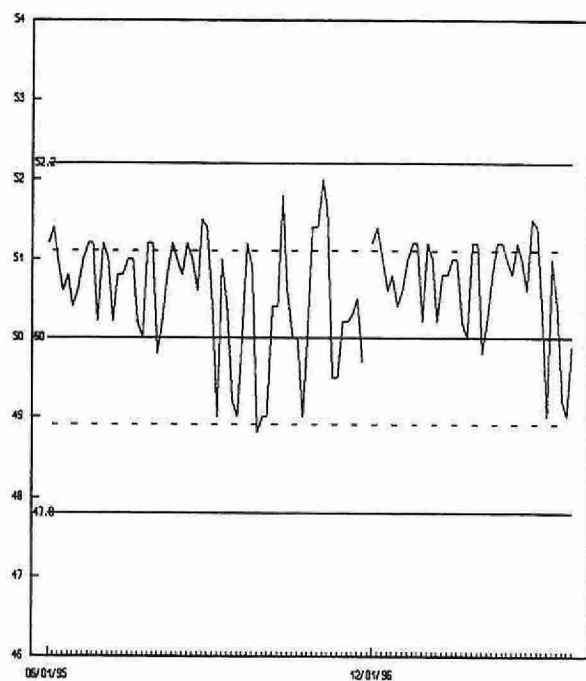
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
289	0.00 - 5.0	0.1428	27.4
9	5.1 - 10.0	0.3525	3.8
6	10.1 - 25.0	0.8471	4.5
1	25.1 - 50.0	N.A.	N.A.
305	Overall	0.1832	

OTHER CHECKS:

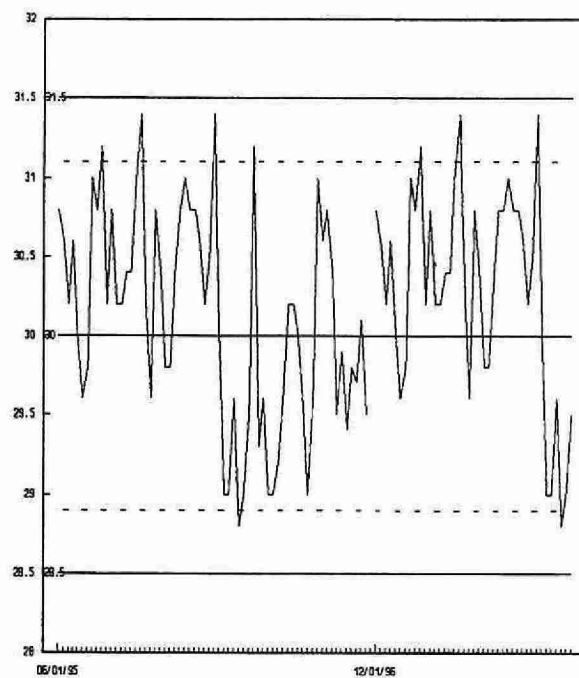
	n	Mean	Standard Deviation (1)
Long Term Blank	105	0.2152	0.0907

PHENOLICS, REACTIVE ($\mu\text{g/L}$ as Phenol)

QUALITY CONTROL DATA FROM 06/01/95 TO 20/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

PHOSPHORUS, REACTIVE ortho-PHOSPHATE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3364A	Units	mg/L as P
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Ortho-phosphate is determined on the supernatant of a settled sample by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.2 at the full scale level.

Ammonia plus ammonium, nitrite, and nitrate plus nitrite are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using IR sensitive phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.0005	Current T value: 0.0025
--------------------------------	-------------------------	-------------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

PHOSPHORUS, REACTIVE ortho-PHOSPHATE

QUALITY CONTROL DATA FROM 04/01/95 TO 18/12/96

Laboratory Unit: Colourimetry

Full Scale: to 0.100 mg/L as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	184	0.080	0.0798	-0.0002	0.0010
B:	184	0.040	0.0400	0.0000	0.0008
C:	184	0.008	0.0082	0.0002	0.0007
A+B:	184	0.120	0.1197	-0.0003	0.0015
A-B:	184	0.040	0.0398	-0.0002	0.0012
B+C:	184	0.048	0.0481	0.0001	0.0013
B-C:	184	0.032	0.0318	-0.0002	0.0009

s.d.(AB) S(between runs): 0.0009 Sw(within run): 0.0008 S/Sw: 1.1
s.d.(BC) S(between runs): 0.0008 Sw(within run): 0.0006 S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.1152 - 0.1248 for A+B
0.0364 - 0.0436 for A-B
0.0448 - 0.0512 for B+C
0.0296 - 0.0344 for B-C

DUPLICATES:

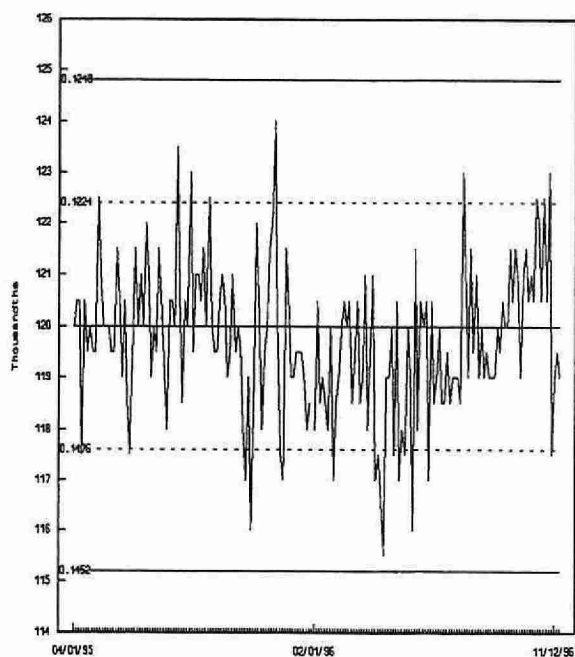
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
378	0.000 - 0.010	0.00073	41.9
54	0.011 - 0.020	0.00124	19.5
50	0.021 - 0.050	0.00244	17.2
20	0.051 - 0.100	0.00251	19.3
502	Overall	0.00092	

OTHER CHECKS:

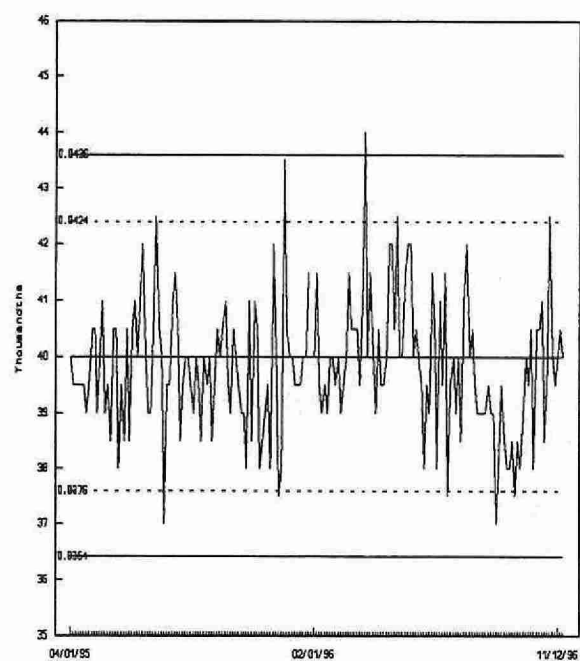
	n	Mean	Standard Deviation (1)
Long Term Blank	184	0.00032	0.00078

PHOSPHORUS, REACTIVE ortho-PHOSPHATE (mg/L as P)

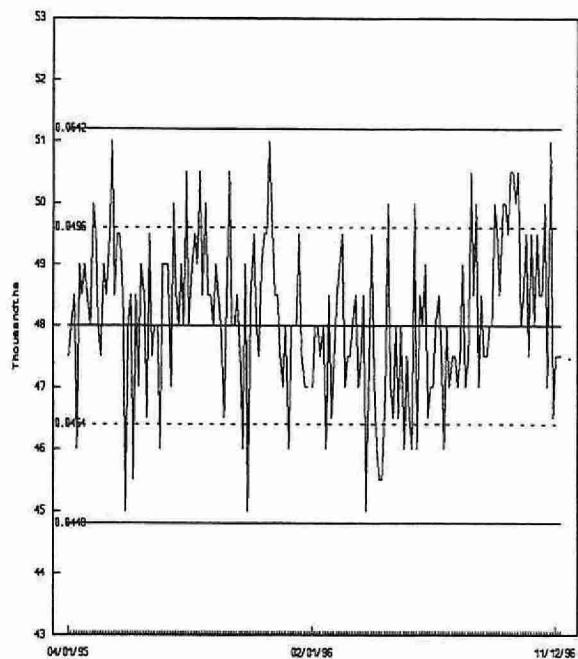
QUALITY CONTROL DATA FROM 04/01/95 TO 18/12/96



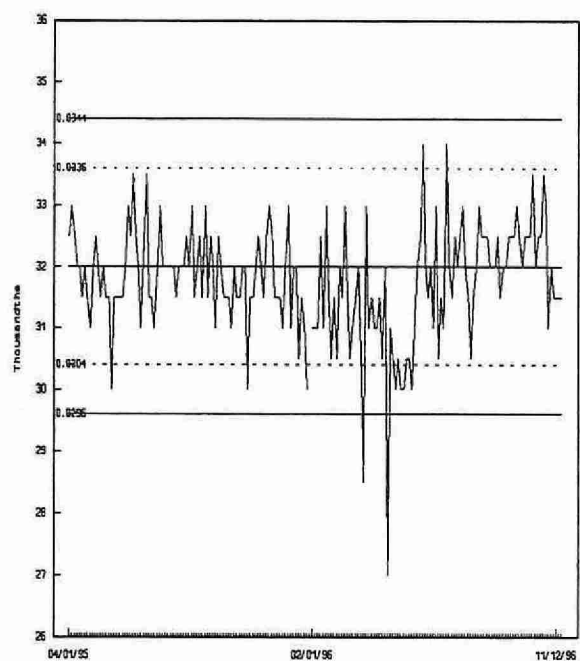
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

———— Control Limit
 ----- Warning Limit

PHOSPHORUS, REACTIVE ortho-PHOSPHATE

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3366A	Units	mg/L as P
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Domestic Waters, Effluents		

SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Ortho-phosphate is determined on the supernatant of a settled sample by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.5 at the full scale level.

Ammonia plus ammonium, nitrite, and nitrate plus nitrite are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using IR sensitive phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
--------------------------------	-----------------------	----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

PHOSPHORUS, REACTIVE ortho-PHOSPHATE

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96

Laboratory Unit: Colourimetry

Full Scale: to 10.0 mg/L as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	143	8.00	7.989	-0.011	0.0426
B:	143	4.00	3.990	-0.010	0.0211
C:	143	0.800	0.804	0.004	0.0109
A+B:	143	12.0	11.979	-0.021	0.0497
A-B:	143	4.00	3.998	0.002	0.0452
B+C:	143	4.80	4.795	-0.005	0.0269
B-C:	143	3.20	3.186	-0.004	0.0201

s.d.(AB) S(between runs): 0.034 Sw(within run): 0.032 S/Sw: 1.1
s.d.(BC) S(between runs): 0.017 Sw(within run): 0.014 S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

11.71 - 12.29 for A+B
3.78 - 4.22 for A-B
4.66 - 4.94 for B+C
3.09 - 3.31 for B-C

DUPLICATES:

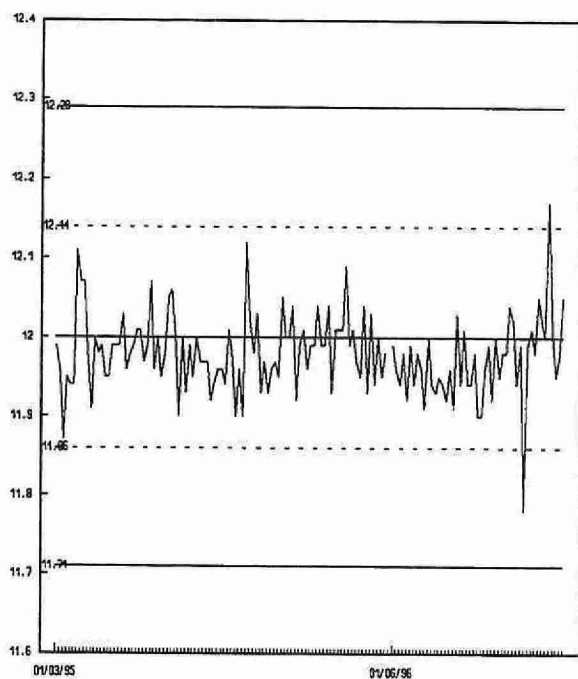
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
372	0.000 - 1.00	0.0129	19.8
26	1.01 - 2.00	0.0344	3.1
17	2.01 - 5.00	0.0491	1.4
10	5.01 - 10.0	0.1361	4.2
425	Overall	0.0154	

OTHER CHECKS:

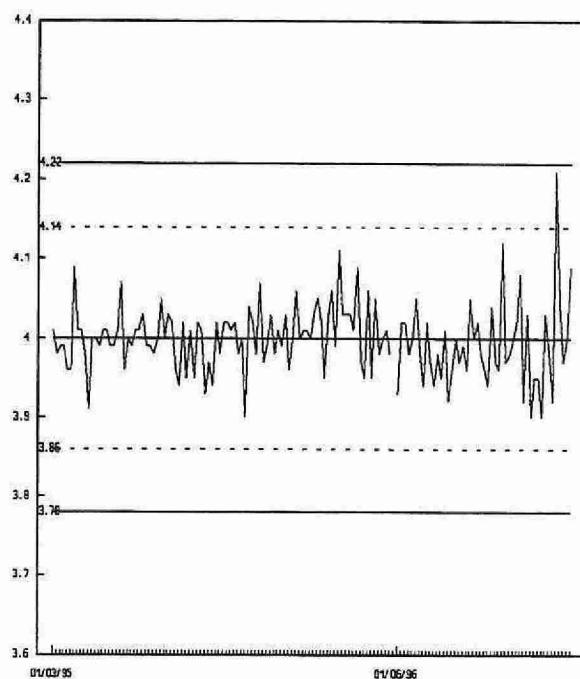
	n	Mean	Standard Deviation (1)
Long Term Blank	143	0.0013	0.0100

PHOSPHORUS, REACTIVE ortho-PHOSPHATE (mg/L as P)

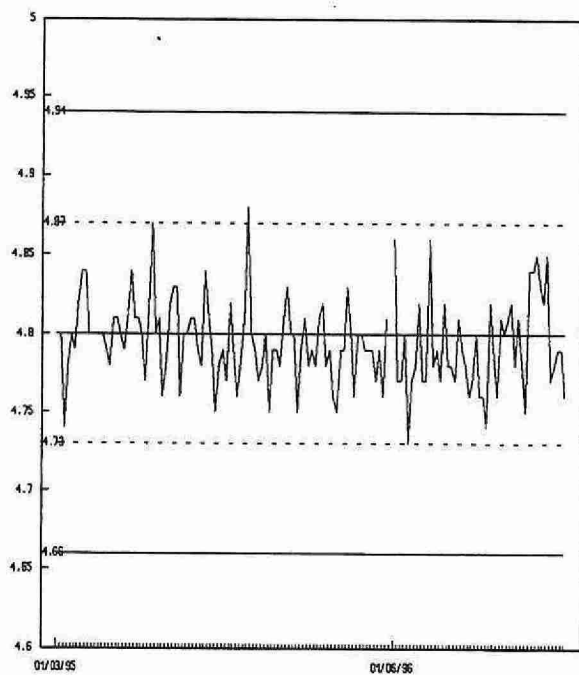
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96



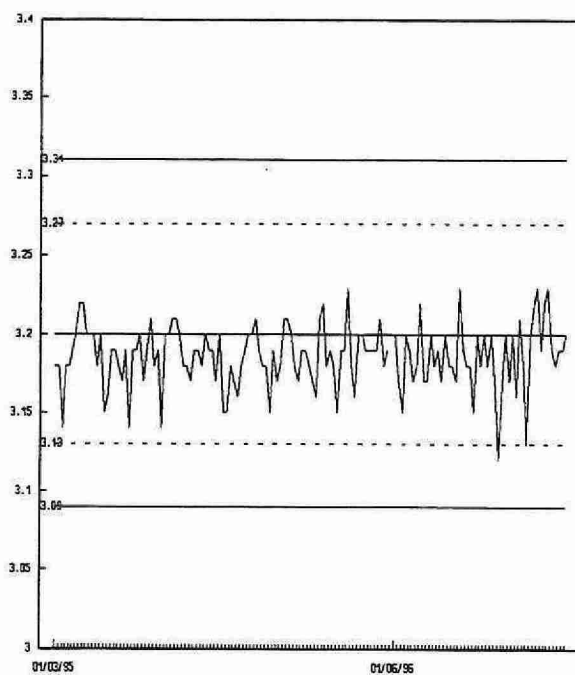
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B-C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

PHOSPHORUS, TOTAL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	Mar '89
Method Reference No	E3116A	Units	mg/g as P
LIMS Product Code	TNP3116	Supervisor	J. McBride
Sample Type/Matrix	Soil, Sediment and Sludge		

SAMPLING:

Quantity Required	0.08 to 0.4 g
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Phosphorus compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

INSTRUMENTATION:

Hot plate

Basic automated modular continuous flow system : Colourimetric measurement is through a 5 cm. light path at 660 nm.

Data capture, and processing via a microcomputer system

REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.02	Current T value: 0.10
---	-----------------------	-----------------------

CALIBRATION:

3 High and 2 Low Calibration Standards

CONTROLS:

Calibration	In house composite B-Soil/sediment, plus QC Soils/Sediment (RS92)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

NOTES:

System is calibrated with undigested standards.

PHOSPHORUS, TOTAL

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96

Laboratory Unit: Colourimetry

Full Scale: 5 mg/g as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
RS92	90	0.47	0.472	0.002	0.0283

The calibration is accepted if the calibration control values obtained lie within the ranges:

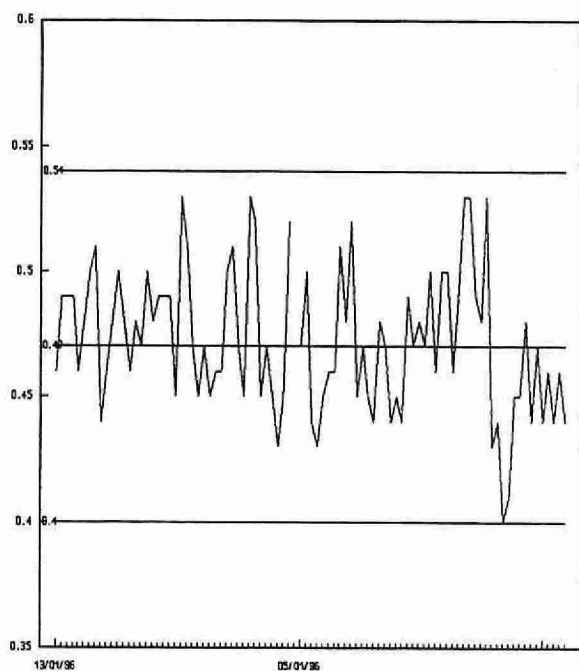
0.40 - 0.54 for RS92

DUPLICATES: (Sediment/Soils)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
35	0.00 - 0.50	0.0248	7.3
74	0.51 - 1.00	0.0378	4.5
58	1.01 - 2.50	0.0474	3.3
4	2.51 - 5.00	0.1406	4.4
171	Overall	0.0403	

PHOSPHORUS, TOTAL (mg/g as P)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD
RS92 - Sediment and soil control

_____ Control Limit

PHOSPHORUS, TOTAL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	Mar '89
Method Reference No	E3118A	Units	mg/g as P
LIMS Product Code	TNP3118	Supervisor	J. McBride
Sample Type/Matrix	Terrestrial and aquatic vegetation		

SAMPLING:

Quantity Required	0.02 to 0.04 g
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Phosphorus compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

INSTRUMENTATION:

Hot plate.

Basic automated modular continuous flow system : Colourimetric measurement is through a 5 cm. light path at 660 nm.
Data capture, and processing via a microcomputer system.

REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.02	Current T value: 0.10
---	-----------------------	-----------------------

CALIBRATION:

3 High and 2 Low Calibration Standards

CONTROLS:

Calibration	In house composite A-VEG, plus QC VEG (Pine Needles)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

NOTES:

System is calibrated with undigested standards.

PHOSPHORUS, TOTAL

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96

Laboratory Unit: Colourimetry

Full Scale: 8 mg/g as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
Pine Needles (non certified)	74	1.20	1.199	-0.001	0.0427

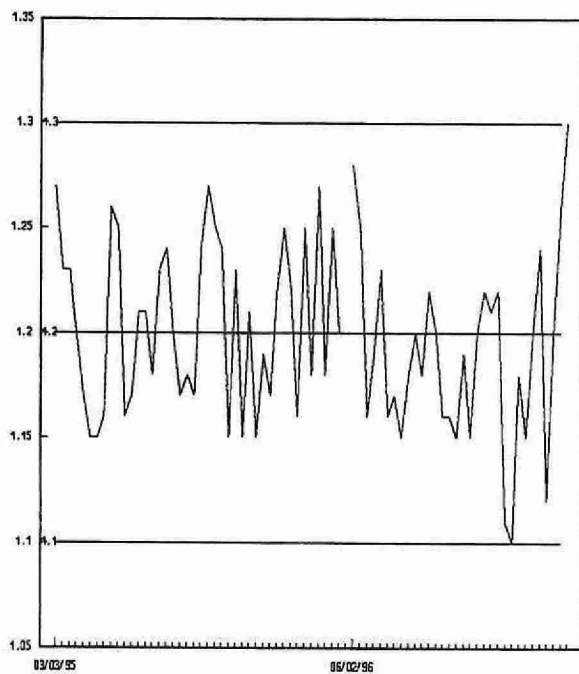
The calibration is accepted if the calibration control values obtained lie within the ranges:
1.1 - 1.3 for Pine Needles

DUPLICATES: (Vegetation)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
26	0.00 - 1.60	0.0538	4.0
81	1.61 - 4.00	0.1089	4.4
44	4.01 - 8.00	0.2123	4.5
151	Overall	0.1288	

PHOSPHORUS, TOTAL (mg/g as P)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD
Pine Needle

_____ Control Limit

PHOSPHORUS, TOTAL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3367A	Units	mg/L as P
LIMS Product Code	TOTNUT3367	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digesters kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line and then orthophosphate is determined by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.4 at the full scale level.

Total Kjeldahl nitrogen is determined simultaneously.

INSTRUMENTATION:

Three Block digesters

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.002	Current T value: 0.01
--------------------------------	------------------------	-----------------------

CALIBRATION:

BL plus 7 undigested standards

CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

PHOSPHORUS, TOTAL

QUALITY CONTROL DATA FROM 05/01/95 TO 18/12/96

Laboratory Unit: Colourimetry

Full Scale: to 0.200 mg/L as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	236	0.160	0.1609	0.0009	0.0012
B:	236	0.080	0.0801	0.0001	0.0006
C:	236	0.016	0.0158	-0.0002	0.0008
A+B:	236	0.240	0.2410	0.0010	0.0014
A-B:	236	0.080	0.0809	0.0009	0.0012
B+C:	236	0.096	0.0959	-0.0001	0.0010
B-C:	236	0.064	0.0643	0.0003	0.0009

s.d.(AB)	S(between runs):	0.0009	Sw(within run):	0.0008	S/Sw: 1.1
s.d.(BC)	S(between runs):	0.0007	Sw(within run):	0.0007	S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.2332	-	0.2468	for	A+B
0.0749	-	0.0851	for	A-B
0.092	-	0.100	for	B+C
0.061	-	0.067	for	B-C

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
236	0.140	0.1388	0.0051
236	0.084	0.0838	0.0047
236	0.028	0.0285	0.0026

DUPLICATES:

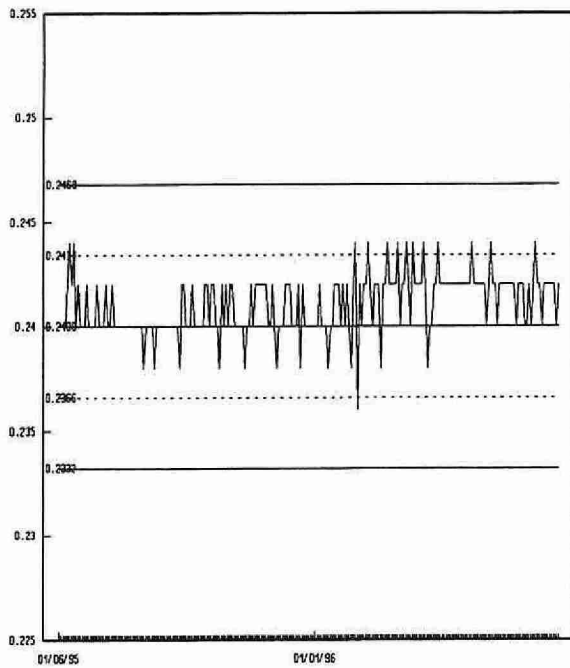
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
445	0.000 - 0.020	0.0021	27.9
106	0.021 - 0.040	0.0034	17.0
99	0.041 - 0.100	0.0037	9.9
29	0.101 - 0.200	0.0050	3.7
679	Overall	0.0026	

OTHER CHECKS:

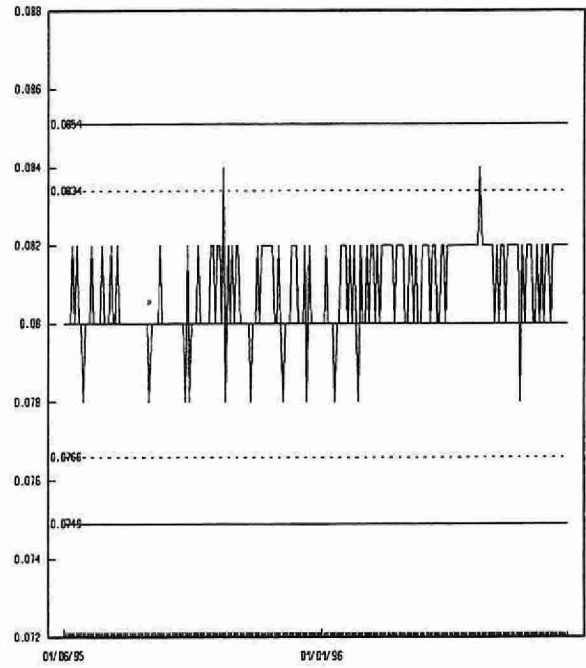
	n	Mean	Standard Deviation (1)
Long Term Blank	236	0.0002	0.0008
Digested Blank	236	0.0029	0.0028

PHOSPHORUS, TOTAL (mg/L as P)

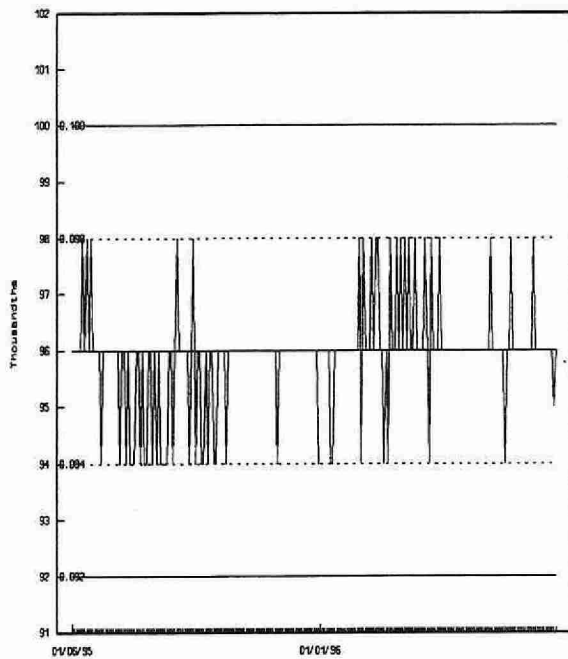
QUALITY CONTROL DATA FROM 05/01/95 TO 18/12/96



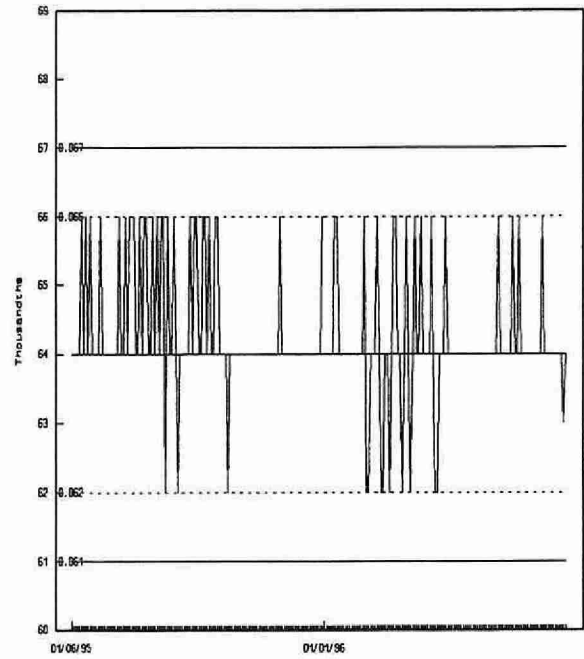
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 - - - - - Warning Limit

PHOSPHORUS, TOTAL

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3368A	Units	mg/L as P
LIMS Product Code	TOTNUT3368	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Domestic Waters, Effluents, Leachates		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digestors kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line and then orthophosphate is determined by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.8 at the full scale level.

Total Kjeldahl Nitrogen is determined simultaneously.

INSTRUMENTATION:

3-Block digesters

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using an IR sensitive phototube. Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

NOTES:

System is calibrated with undigested standards.

PHOSPHORUS, TOTAL

QUALITY CONTROL DATA FROM 05/01/95 TO 19/12/96

Laboratory Unit: Colourimetry

Full Scale: to 10.0 mg/L as P

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	134	8.0	7.991	-0.009	0.0337
B:	134	4.0	4.000	0.000	0.0161
C:	134	0.8	0.806	0.006	0.0133
A+B:	134	12.0	11.991	-0.009	0.0394
A-B:	134	4.0	3.991	-0.009	0.0352
B+C:	134	4.8	4.806	0.006	0.0245
B-C:	134	3.2	3.194	-0.006	0.0164

s.d.(AB)	S(between runs):	0.0264	Sw(within run):	0.0249	S/Sw: 1.1
s.d.(BC)	S(between runs):	0.0147	Sw(within run):	0.0116	S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

11.87	-	12.13	for	A+B
3.903	-	4.097	for	A-B
4.732	-	4.868	for	B+C
3.149	-	3.251	for	B-C

RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
134	7	6.92	0.1083
134	4.2	4.16	0.0665
134	1.4	1.39	0.0359

DUPLICATES:

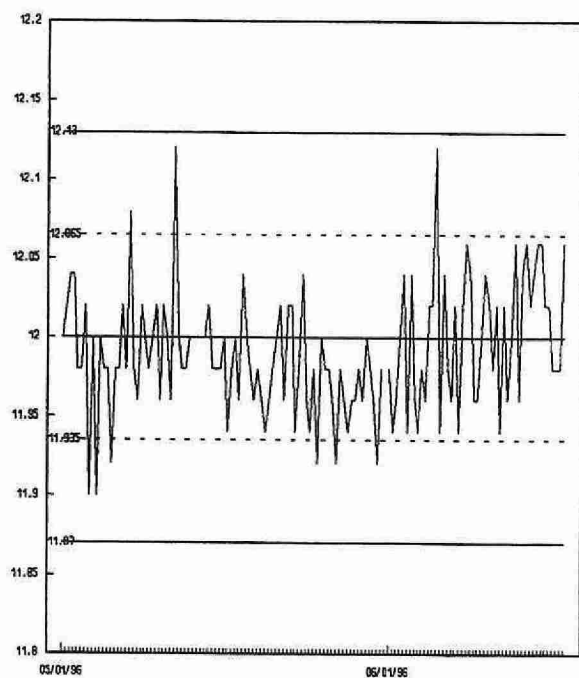
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
265	0.00 - 1.00	0.0168	17.2
35	1.00 - 2.00	0.0303	6.3
56	2.00 - 5.00	0.0686	2.1
8	5.00 - 10.00	0.0902	1.5
364	Overall	0.0251	

OTHER CHECKS:

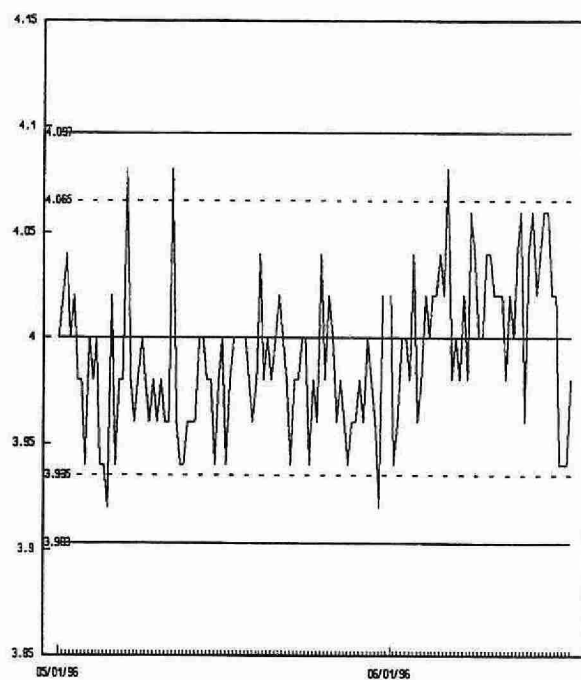
	n	Mean	Standard Deviation (1)
Long Term Blank	134	0.004	0.0104
Digested Blank	134	0.009	0.0129

PHOSPHORUS, TOTAL (mg/L as P)

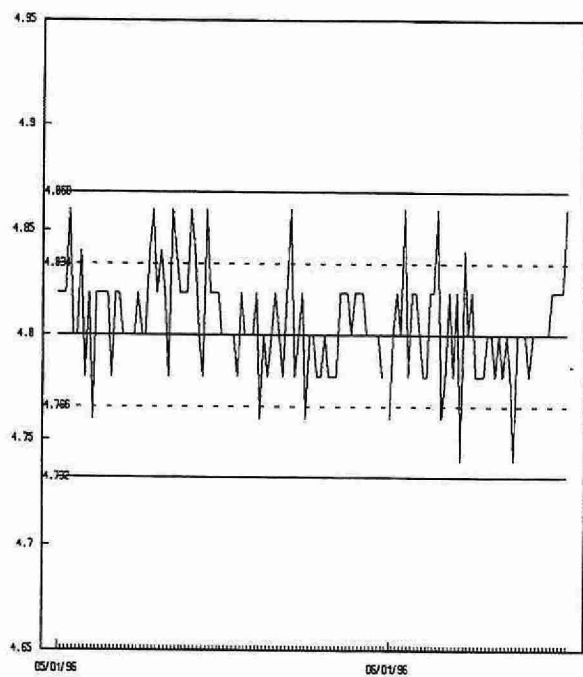
QUALITY CONTROL DATA FROM 05/01/95 TO 19/12/96



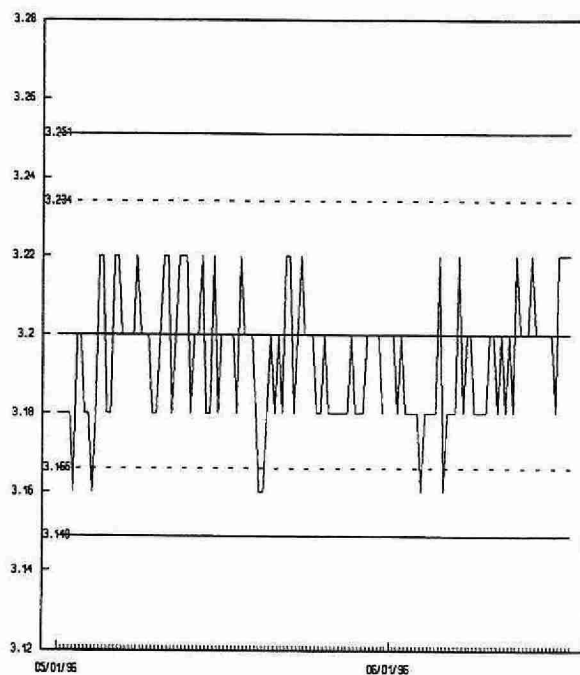
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

POTASSIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	18/05/79
Method Reference No.	E3146A	Units	mg/L as K, ($\mu\text{g}/\text{filter}$ as K)
LIMS Product Code	CAT3146, (NAK3146)	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, (LOVOL Filter Extracts)		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures	Current W value		Current T value	
3	0.002 mg/L	(0.1 $\mu\text{g}/\text{filter}$)	0.010 mg/L	(0.5 $\mu\text{g}/\text{filter}$)

CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

POTASSIUM

QUALITY CONTROL DATA FROM 05/01/95 TO 13/12/96

Laboratory Unit: Atomic Absorption

Full Scale: to 1.00 mg/L as K

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	38	0.60	0.6033	0.0033	0.0072
B:	38	0.10	0.1022	0.0022	0.0037
A+B:	38	0.70	0.7054	0.0054	0.0085
A-B:	38	0.50	0.5011	0.0011	0.0077

s.d.(AB)

S(between runs): 0.006

Sw(within run): 0.005

S/Sw: 1.05

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.672 - 0.728 for A+B

0.479 - 0.521 for A-B

DUPLICATES:

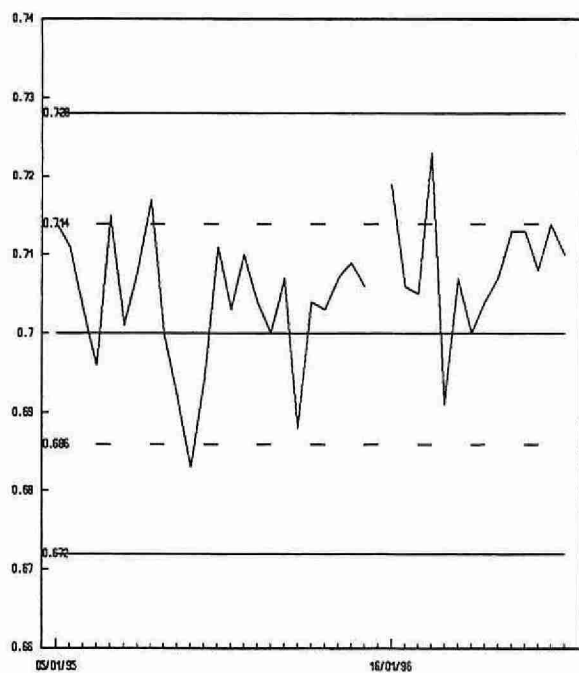
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
56	0.000 - 0.100	0.0015	26.1
6	0.101 - 0.200	0.0016	1.1
4	0.201 - 0.500	0.0008	0.2.
3	0.501 - 1.000	0.0094	1.1
69	Overall	0.0020	

OTHER CHECKS:

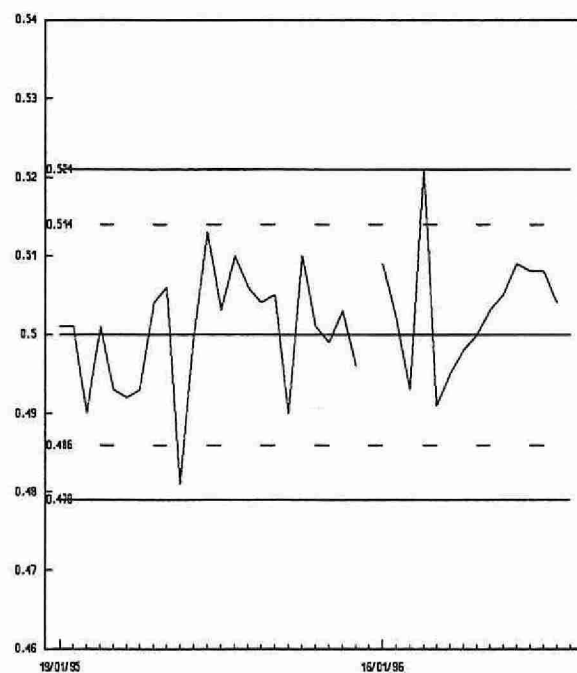
	n	Mean	Standard Deviation (1)
Long Term Blank	24	0.008	0.0344

POTASSIUM (mg/L as K)

QUALITY CONTROL DATA FROM 05/01/95 TO 13/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

POTASSIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as K
LIMS Product Code	CAT3171, NAK3171	Supervisor	J. McBride
Sample Type/Matrix	Surface Waters, DWSP Drinking Waters		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm using an air-acetylene flame. Cesium is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.923 at the full scale value.

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 11 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

POTASSIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96

Laboratory Unit: Atomic Absorption

Full Scale: to 5.00 mg/L as K

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	210	4.00	4.02	0.02	0.0502
B:	210	1.00	1.01	0.01	0.0192
C:	210	0.25	0.25	0.00	0.0074
A+B:	210	5.00	5.03	0.03	0.0577
A-B:	210	3.00	3.01	0.01	0.0495
B+C:	210	1.25	1.26	0.01	0.0233
B-C:	210	0.75	0.76	0.01	0.0173

s.d.(AB) S(between runs): 0.04

Sw(within run): 0.01

S/Sw: 1.09

s.d.(BC) S(between runs): 0.01

Sw(within run): 0.01

S/Sw: 1.19

The calibration is accepted if the calibration control values obtained lie within the ranges:

4.77	-	5.23	for	A+B
2.85	-	3.15	for	A-B
1.175	-	1.325	for	B+C
0.700	-	0.800	for	B-C

DUPLICATES:

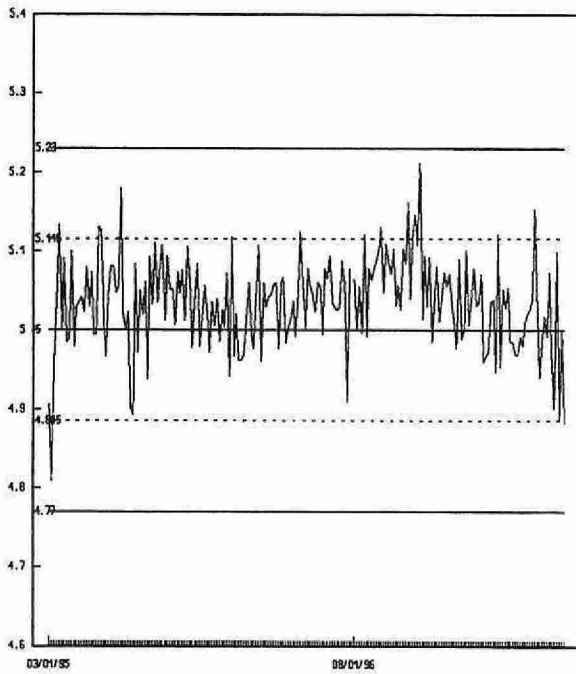
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
66	0.000 - 0.500	0.0073	8.9
98	0.501 - 1.00	0.0115	2.4
274	1.01 - 2.50	0.0188	2.1
148	2.51 - 5.00	0.0421	1.6
586	Overall	0.0208	

OTHER CHECKS:

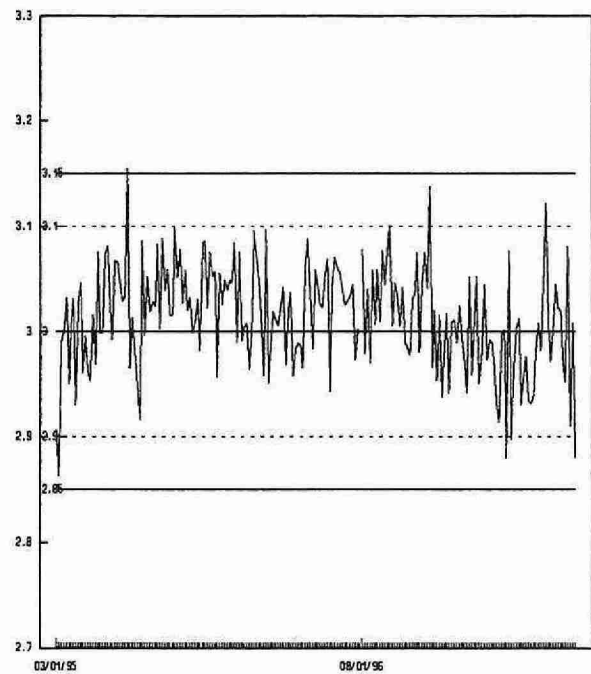
	n	Mean	Standard Deviation (1)
Long Term Blank	210	0.0026	0.0065

POTASSIUM (mg/L as K)

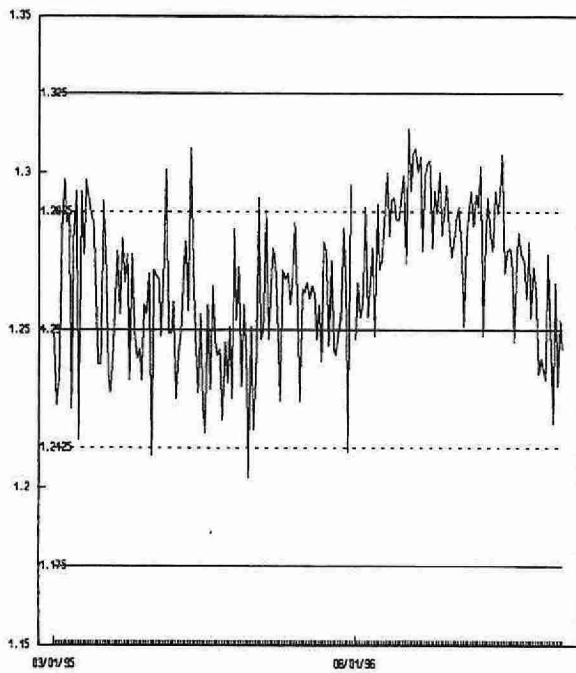
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96



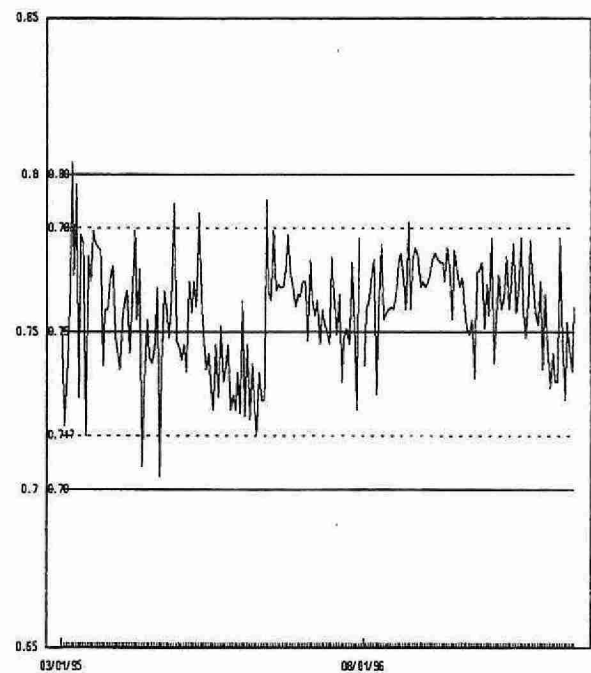
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
----- Warning Limit

POTASSIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as K
LIMS Product Code	CAT3217,K3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage, Industrial Wastes		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm using an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 1.16 at full scale level.

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 11 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

POTASSIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 30/12/96

Laboratory Unit: Absorption

Full Scale: to 25.0 mg/L as K

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	219	20.00	19.86	-0.14	0.2672
B:	219	5.00	4.94	-0.06	0.1142
C:	219	1.25	1.24	-0.01	0.0307
A+B:	219	25.00	24.81	-0.19	0.3277
A-B:	219	15.00	14.92	-0.08	0.2389
B+C:	219	6.25	6.19	-0.06	0.1297
B-C:	219	3.75	3.70	-0.05	0.0889

s.d.(AB) S(between runs): 0.20

Sw(within run): 0.17

S/Sw: 1.2

s.d.(BC) S(between runs): 0.08

Sw(within run): 0.06

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

23.8	-	26.2	for	A+B
14.2	-	15.8	for	A-B
5.65	-	6.85	for	B+C
3.35	-	4.15	for	B-C

DUPLICATES:

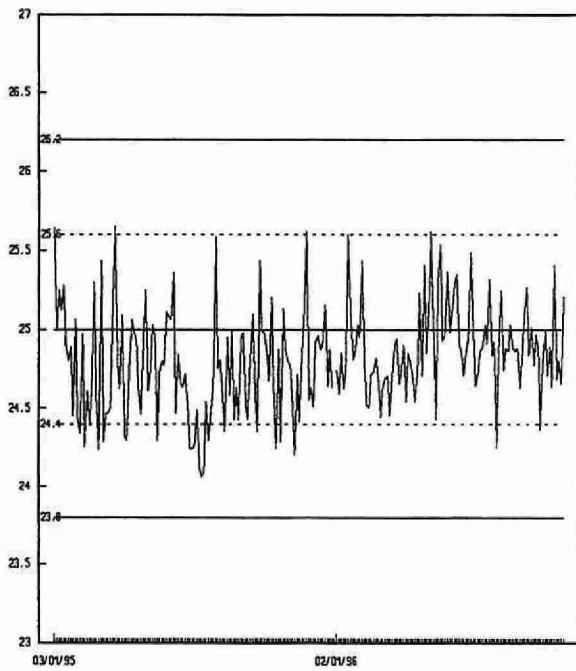
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
446	0.00 - 2.50	0.0255	5.5
95	2.51 - 5.00	0.0362	1.3
71	5.01 - 12.50	0.0713	0.9
25	12.51 - 25.00	0.2294	1.3
637	Overall	0.0342	

OTHER CHECKS:

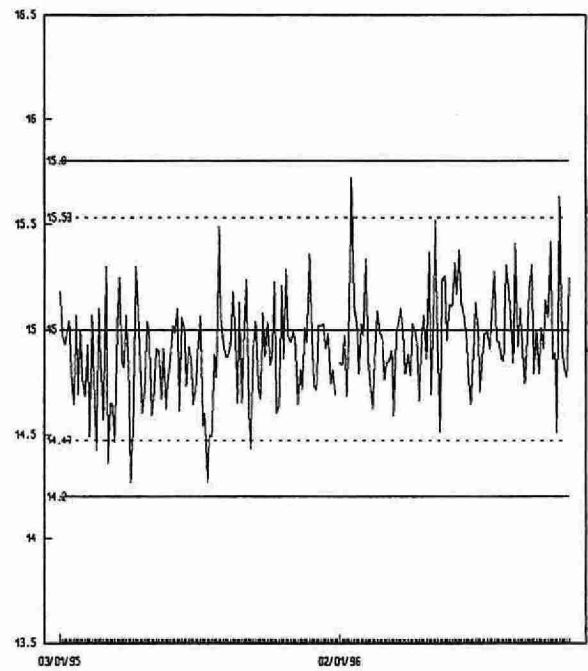
	n	Mean	Standard Deviation (1)
Long Term Blank	216	-0.0019	0.0194

POTASSIUM (mg/L as K)

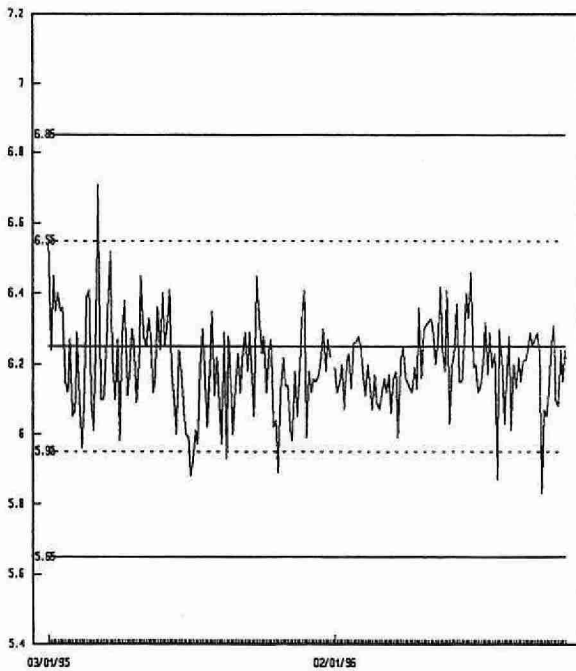
QUALITY CONTROL DATA FROM 03/01/95 TO 30/12/96



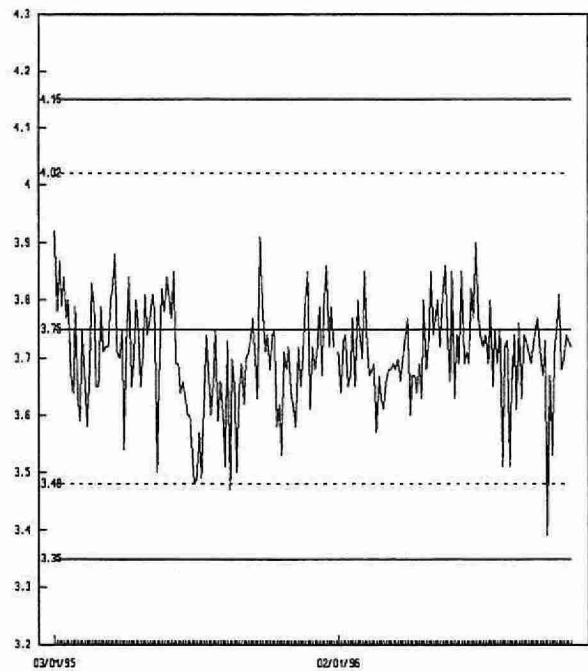
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 - - - - - Warning Limit

POTASSIUM

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as K
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes,		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
--------------------------------	------------------------	------------------------

CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

NOTES:

The control standards are corrected for the LTB from which they were made.

January to June 1996 QC data exceeded the limits on a number of occasions and as a result the uncertainty value associated with reported data during this time period has been assessed to be ± 0.06 mg/L as K. (Further information can be attained from the lab (reference 1QCMEM98).

POTASSIUM

QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/96

Laboratory Unit: Dorset

Full Scale: to 1.0 mg/L as K

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	95	0.80	0.805	0.005	0.0066
B:	95	0.20	0.198	-0.002	0.0074
C:	95	0.05	0.054	0.004	0.0014
A+B:	95	1.00	1.0005	0.0005	0.0110
A-B:	95	0.60	0.607	0.007	0.0104
B+C:	95	0.25	0.2498	-0.0002	0.0124
B-C:	95	0.15	0.143	-0.007	0.0176

s.d.(AB) S(between runs): 0.0070

Sw(within run): 0.0073

S/Sw: 0.95

s.d.(BC) S(between runs): 0.011

Sw(within run): 0.012

S/Sw: 0.90

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.973	-	1.027	for	A+B
0.580	-	0.620	for	A-B
0.228	-	0.272	for	B+C
0.134	-	0.166	for	B-C

DUPLICATES:

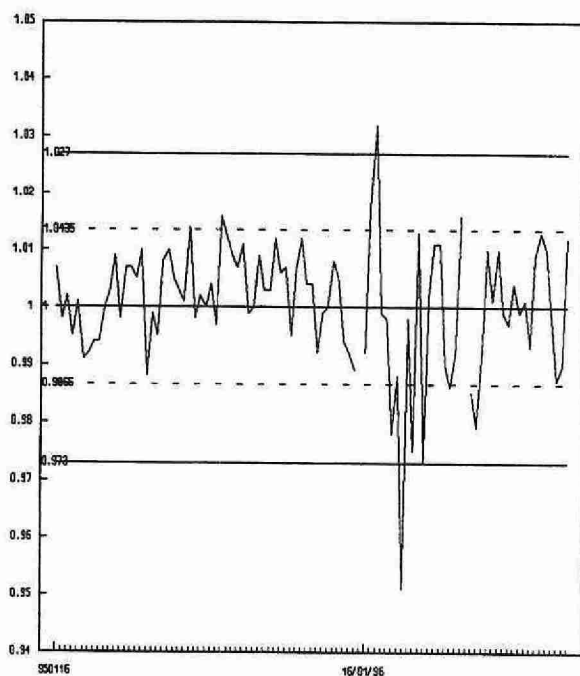
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
56	0.00 - 0.10	0.0030	12.1
39	0.11 - 0.20	0.0134	9.6
111	0.21 - 0.50	0.0121	6.0
41	0.51 - 1.00	0.0172	3.8
247	Overall	0.0102	

OTHER CHECKS:

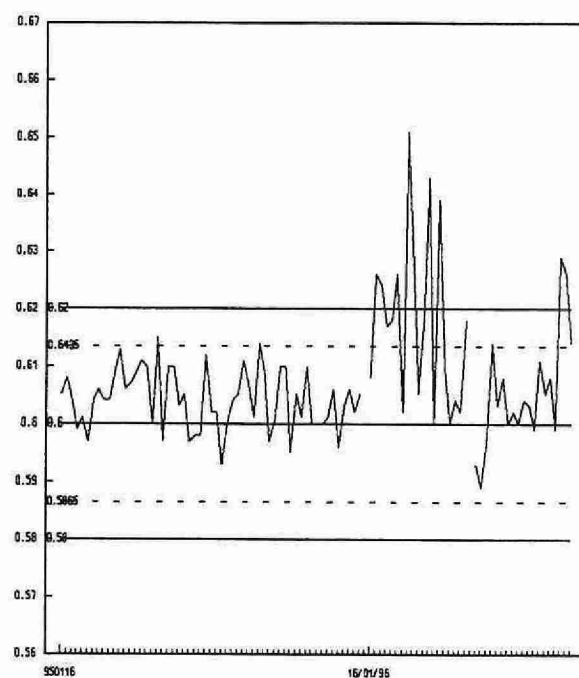
	n	Mean	Standard Deviation (1)
Long Term Blank	95	0.001	0.0026

POTASSIUM (mg/L as K)

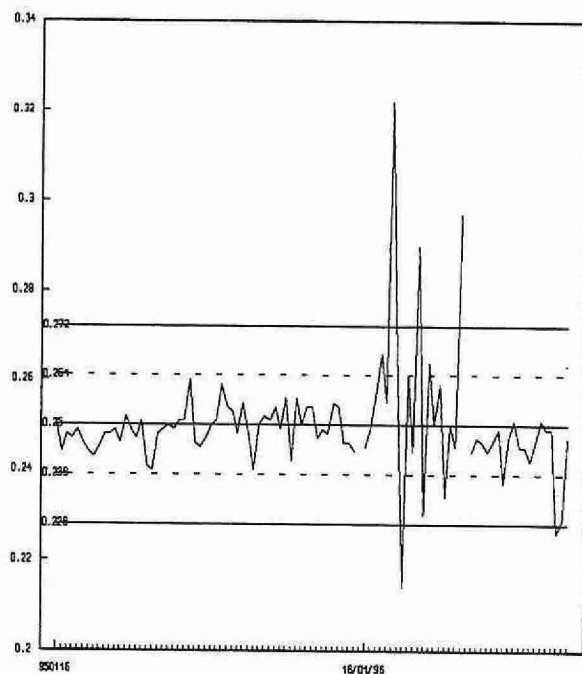
QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/96



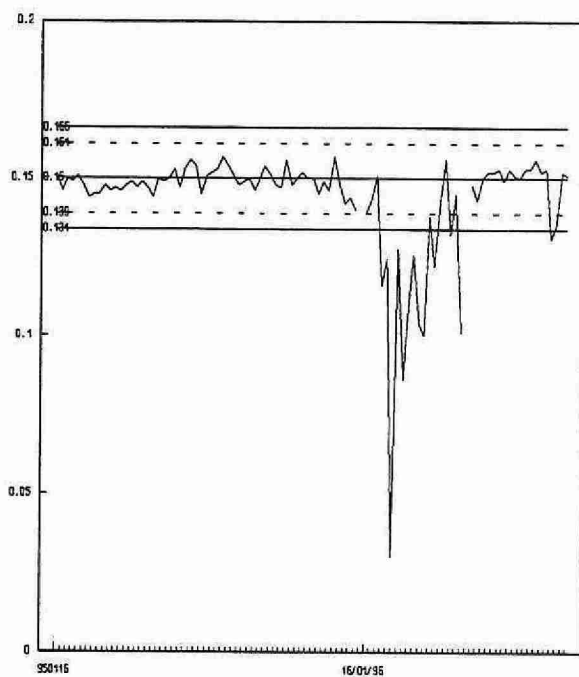
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 - - - - - Warning Limit

SILICON, REACTIVE SILICATES

IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/02/75
Method Reference No.	E3370A	Units	mg/L as Si
LIMS Product Code	DCSI3370	Supervisor	J.McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Water Supplies, Leachates		

SAMPLING:

Quantity Required	10 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Reactive silicates are determined by formation of a reduced molybdo-silicate complex at pH 1.6, using ascorbic acid as the reducing agent, and oxalic acid to suppress phosphate interference.

Approximate absorbance: 0.7 at the full scale level.

Dissolved inorganic and dissolved organic carbon are determined simultaneously.

INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 660 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; standard every 20 samples.

SILICON, REACTIVE SILICATES

QUALITY CONTROL DATA FROM 04/01/95 TO 17/12/96

Laboratory Unit: Colourimetry

Full Scale: to 10.0 mg/L as Si

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	248	8.00	7.994	-0.006	0.0265
B:	248	2.00	1.995	-0.005	0.0154
C:	248	0.50	0.499	-0.001	0.0077
A+B:	248	10.00	9.989	-0.011	0.0365
A-B:	248	6.00	5.999	-0.001	0.0232
B+C:	248	2.50	2.494	-0.006	0.0191
B-C:	248	1.50	1.497	-0.003	0.0151

s.d.(AB) S(between runs): 0.022 Sw(within run): 0.016 S/Sw: 1.3
s.d.(BC) S(between runs): 0.012 Sw(within run): 0.011 S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.66 - 10.34 for A+B
5.75 - 6.25 for A-B
2.37 - 2.63 for B+C
1.40 - 1.60 for B-C

DUPLICATES:

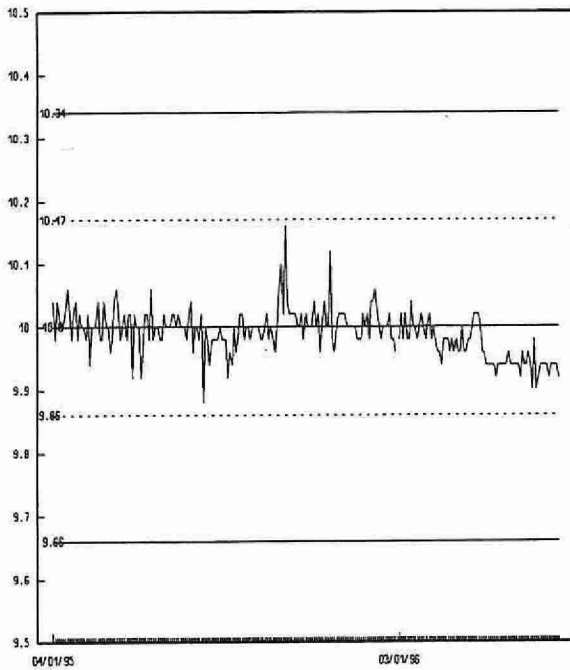
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
207	0.00 - 1.00	0.0144	6.6
228	1.01 - 2.00	0.0679	6.0
208	2.01 - 5.00	0.0170	0.6
84	5.01 - 10.0	0.0308	0.6
727	Overall	0.0851	

OTHER CHECKS:

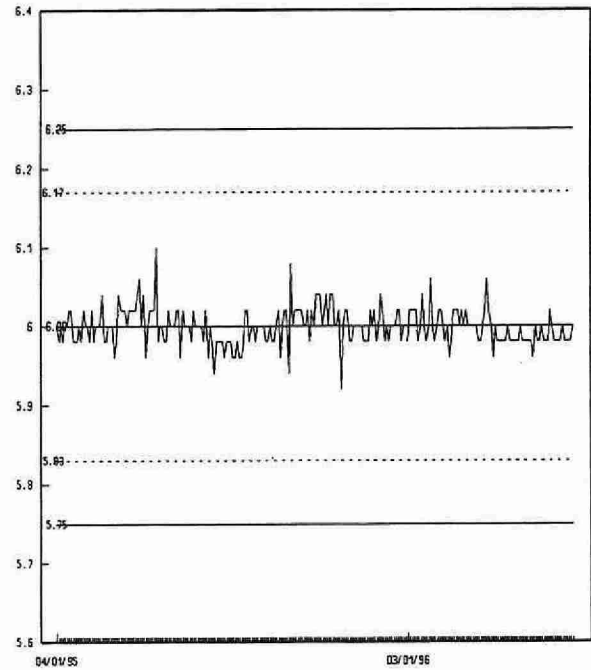
	n	Mean	Standard Deviation (1)
Long Term Blank	248	-0.0019	0.0086

SILICON, REACTIVE SILICATES (mg/L as Si)

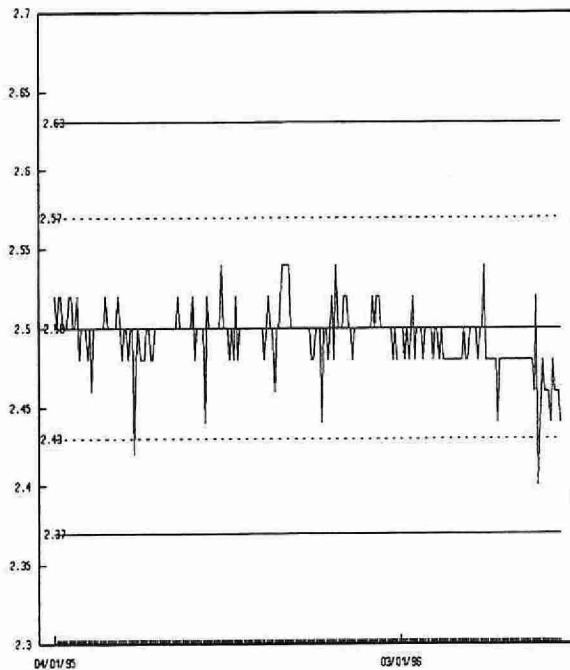
QUALITY CONTROL DATA FROM 04/01/95 TO 17/12/96



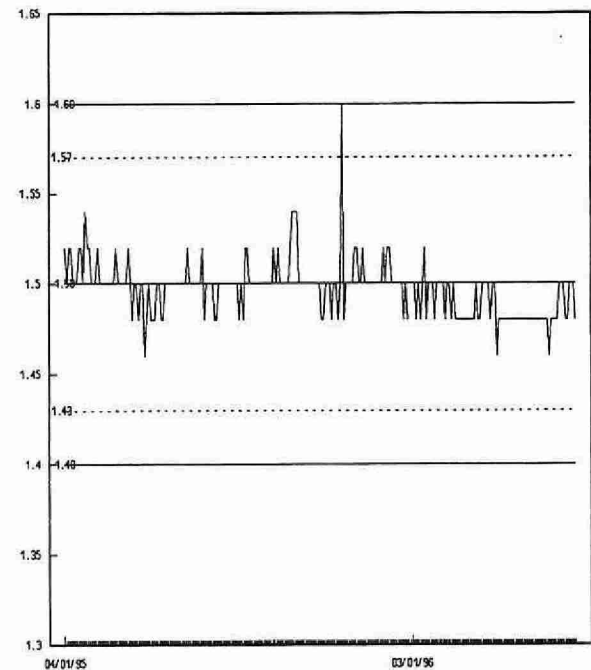
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
----- Warning Limit

SODIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	18/05/79
Method Reference No.	E3146A	Units	mg/L as Na, ($\mu\text{g}/\text{Filter}$)
LIMS Product Code	CAT3146, (NAK3146)	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, (LOVOL Filter Extracts)		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.0 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures	Current W value		Current T value	
3	0.002 mg/L	0.1 $\mu\text{g}/\text{Filter}$	0.010 mg/L	0.5 $\mu\text{g}/\text{Filter}$

CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

SODIUM

QUALITY CONTROL DATA FROM 05/01/95 TO 13/12/96

Laboratory Unit: Atomic Absorption

Full Scale: to 1.0 mg/L as Na

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	39	0.60	0.605	0.005	0.0070
B:	39	0.10	0.104	0.004	0.0036
A+B:	39	0.70	0.709	0.009	0.0083
A-B:	39	0.50	0.502	0.002	0.0073

s.d.(AB) S(between runs): 0.0055 Sw(within run): 0.0052 S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.671 - 0.729 for A+B
0.478 - 0.522 for A-B

DUPLICATES:

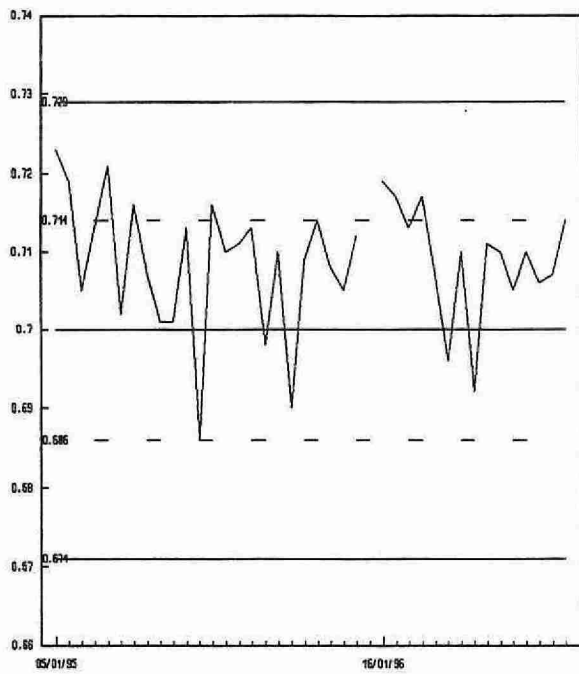
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
46	0.000 - 0.100	0.0014	6.7
15	0.101 - 0.200	0.0037	2.7
10	0.201 - 0.50	0.0020	1.1
3	0.501 - 1.00	0.0095	1.3
74	OVERALL	0.0023	

OTHER CHECKS:

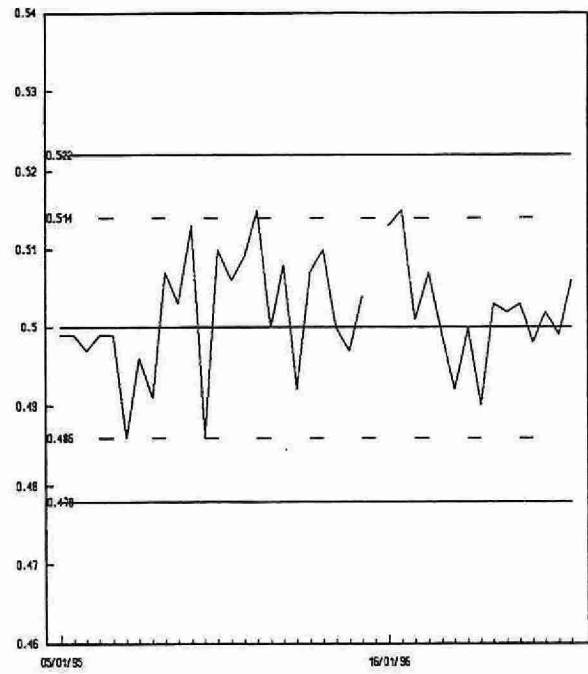
	n	Mean	Standard Deviation (1)
Long Term Blank	39	-0.0010	0.0353

SODIUM (mg/L as Na)

QUALITY CONTROL DATA FROM 05/01/95 TO 13/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

SODIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as Na
LIMS Product Code	CAT3171, NAK3171	Supervisor	J. McBride
Sample Type/Matrix	Surface Waters, DWSP Drinking Waters		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.7 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 1.16 at the full scale level.

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 11 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

SODIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96

Laboratory Unit: Atomic Absorption

Full Scale: to 20.0 mg/L as Na

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	216	16.0	16.1	0.1	0.1387
B:	216	4.00	4.07	0.07	0.0649
C:	216	1.00	1.02	0.02	0.0229
A+B:	216	20.0	20.2	0.2	0.1649
A-B:	216	12.0	12.05	0.05	0.1350
B+C:	216	5.00	5.09	0.09	0.0825
B-C:	216	3.00	3.05	0.05	0.0515

s.d.(AB)	S(between runs):	0.11	Sw(within run):	0.10	S/Sw: 1.1
s.d.(BC)	S(between runs):	0.05	Sw(within run):	0.04	S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

19.4	-	20.6	for	A+B
11.55	-	12.45	for	A-B
4.70	-	5.30	for	B+C
2.775	-	3.225	for	B-C

DUPLICATES:

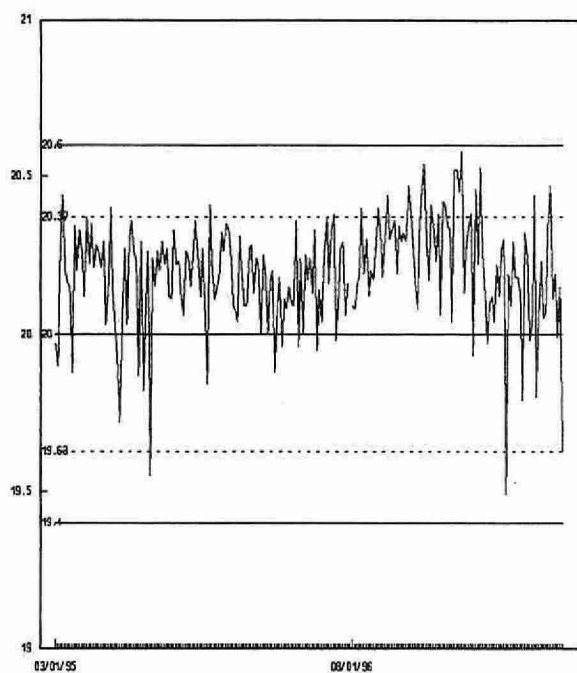
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
82	0.00 - 2.00	0.0293	5.6
77	2.01 - 4.00	0.0433	4.7
154	4.01 - 10.0	0.0726	1.8
146	10.0 - 20.0	0.1409	1.7
459	Overall	0.0777	

OTHER CHECKS:

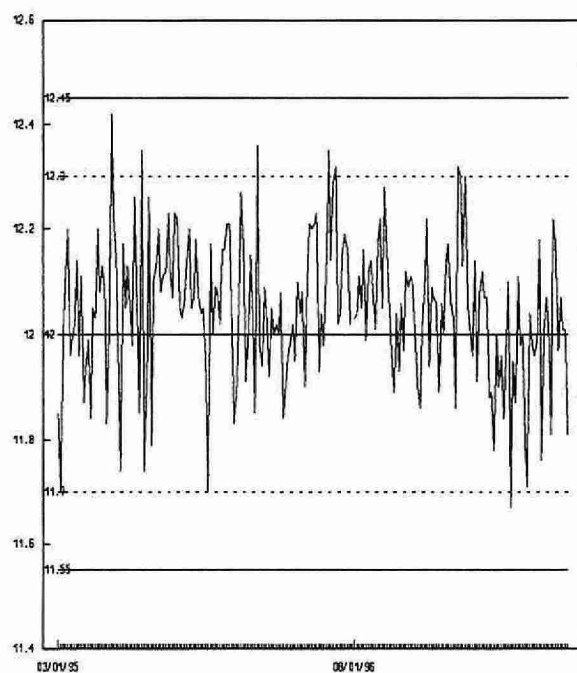
	n	Mean	Standard Deviation (1)
Long Term Blank	216	0.0008	0.0075

SODIUM (mg/L as Na)

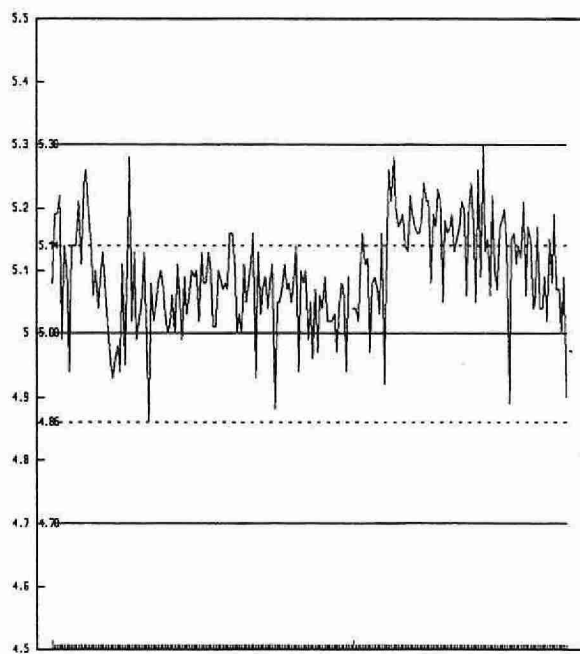
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/96



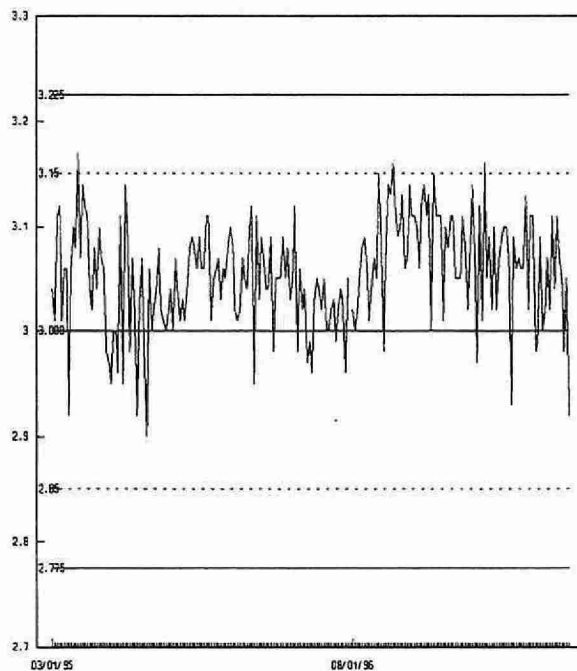
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

SODIUM

IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as Na
LIMS Product Code	CAT3217,CATS3217,NA3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage, Industrial Wastes		

SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.0 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 1.21 at the full scale level.

INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1.0
--------------------------------	----------------------	----------------------

CALIBRATION:

BL plus 11 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

SODIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 30/12/96

Laboratory Unit: Absorption

Full Scale: to 100.00 mg/L as Na

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	291	80.0	79.59	-0.41	1.4607
B:	291	20.0	19.86	-0.14	0.4112
C:	291	5.0	4.999	-0.001	0.1128
A+B:	291	100.0	99.39	-0.61	1.2714
A-B:	291	60.0	59.67	-0.37	0.9136
B+C:	291	25.0	24.86	-0.14	0.4972
B-C:	291	15.0	14.86	-0.14	0.3512

s.d.(AB)	S(between runs):	1.07	Sw(within run):	0.65	S/Sw: 1.7
s.d.(BC)	S(between runs):	0.30	Sw(within run):	0.25	S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

96.0	-	104.0	for	A+B
57.0	-	63.0	for	A-B
23.0	-	27.0	for	B+C
13.5	-	16.5	for	B-C

DUPLICATES:

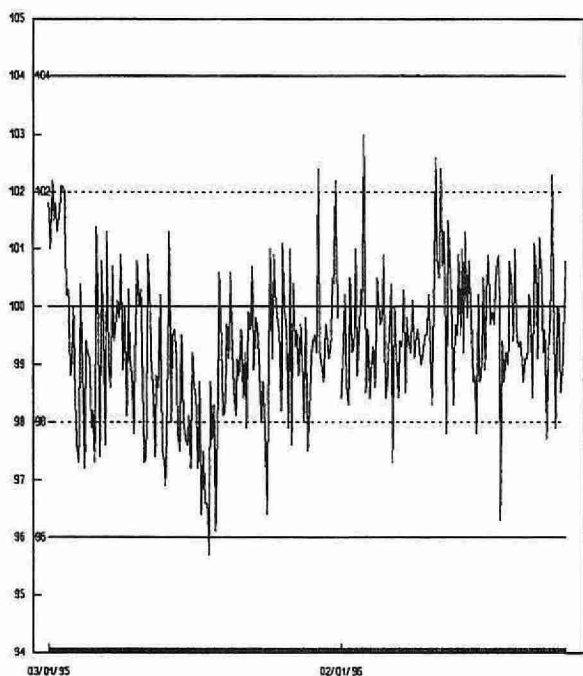
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
307	0.00 - 10.00	0.1144	2.4
268	10.01 - 25.00	0.1899	3.3
116	25.01 - 50.00	0.3499	1.1
128	50.01 - 100.00	0.6796	0.9
819	Overall	0.2351	

OTHER CHECKS:

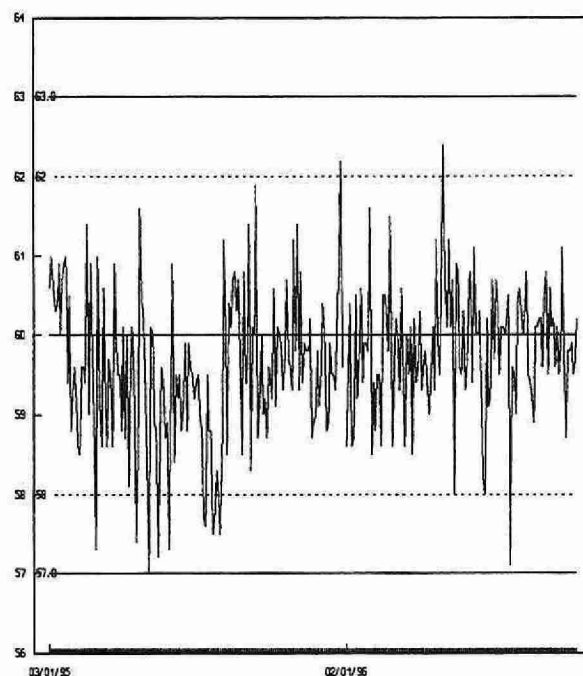
	n	Mean	Standard Deviation (1)
Long Term Blank	287	-0.0004	0.1590

SODIUM (mg/L as Na)

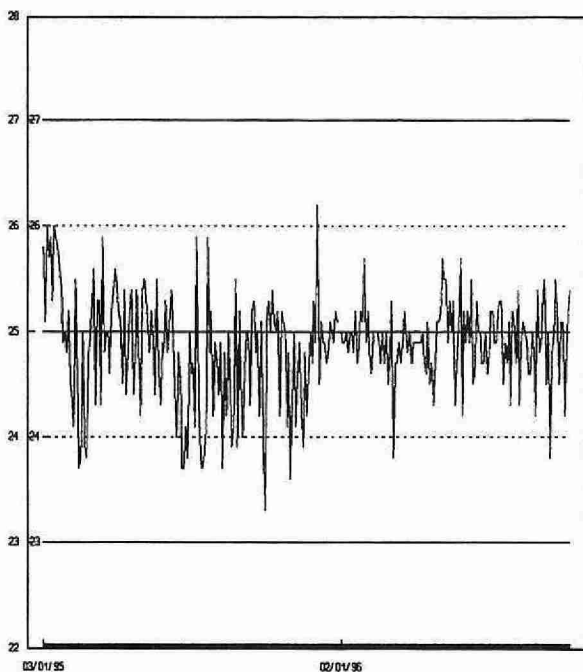
QUALITY CONTROL DATA FROM 03/01/95 TO 30/12/96



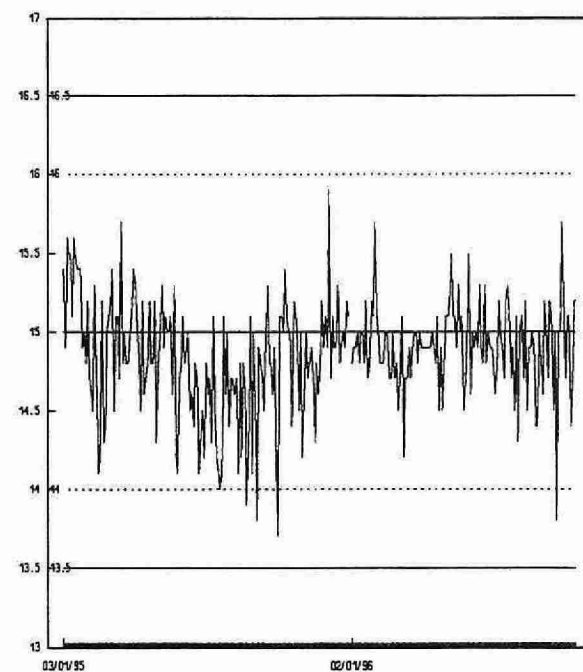
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

———— Control Limit
 ----- Warning Limit

SODIUM

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as Na
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes,		

SAMPLING:

Quantity Required	5 mL
Container	Plastic

ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.0 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
--------------------------------	------------------------	------------------------

CALIBRATION:

BL plus 5 standards

CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

NOTES:

The control standards are corrected for the LTB from which they were made.

January to June 1996 QC data exceeded the limits on a number of occasions and as a result the uncertainty value associated with reported data during this time period has been assessed to be ± 0.10 mg/L as Na. (Further information can be attained from the lab (reference 1QCMEM98).

SODIUM

QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/96

Laboratory Unit: Dorset

Full Scale: to 4.0 mg/L as Na

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	97	3.2	3.194	-0.006	0.0256
B:	97	0.8	0.799	-0.001	0.0110
C:	97	0.2	0.221	0.021	0.0444
A+B:	97	4.0	3.999	-0.001	0.0477
A-B:	97	2.4	2.395	-0.005	0.0256
B+C:	97	1.0	1.026	0.026	0.0639
B-C:	97	0.6	0.578	-0.022	0.0483

s.d.(AB)	S(between runs):	0.020	Sw(within run):	0.018	S/Sw: 1.09
s.d.(BC)	S(between runs):	0.032	Sw(within run):	0.034	S/Sw: 0.95

The calibration is accepted if the calibration control values obtained lie within the ranges:

3.91	-	4.09	for	A+B
2.33	-	2.47	for	A-B
0.958	-	1.042	for	B+C
0.568	-	0.632	for	B-C

DUPLICATES:

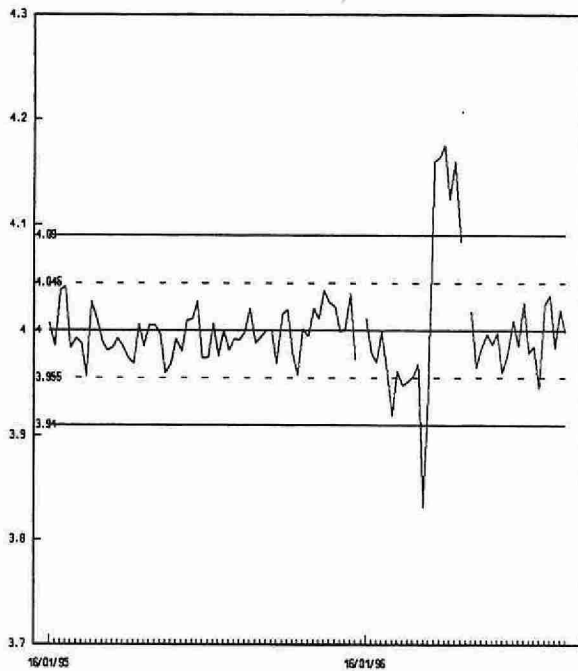
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
56	0.00 - 0.40	0.0048	8.3
119	0.41 - 0.80	0.0151	3.6
59	0.81 - 2.00	0.0250	2.6
18	2.01 - 4.00	0.0401	1.2
252	Overall	0.0172	

OTHER CHECKS:

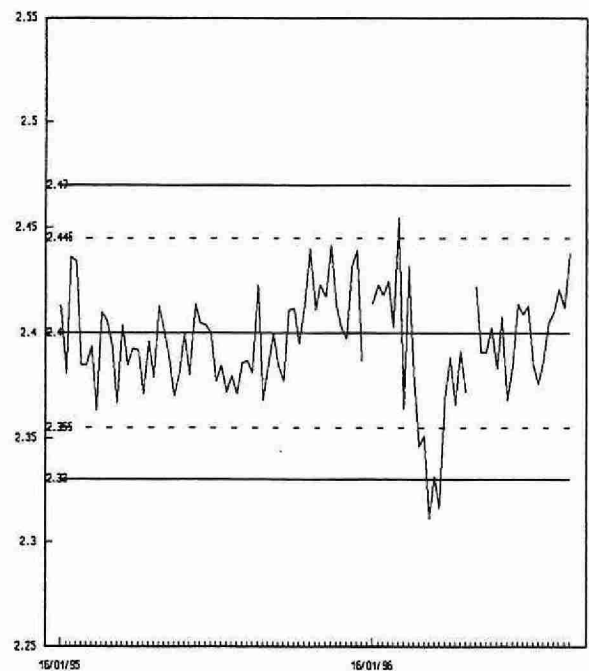
	n	Mean	Standard Deviation (1)
Long Term Blank	96	-0.0014	0.0114

SODIUM (mg/L as Na)

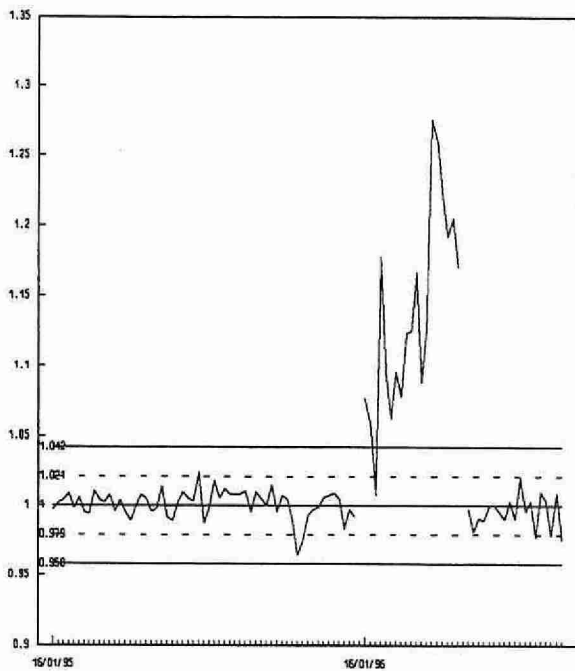
QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/96



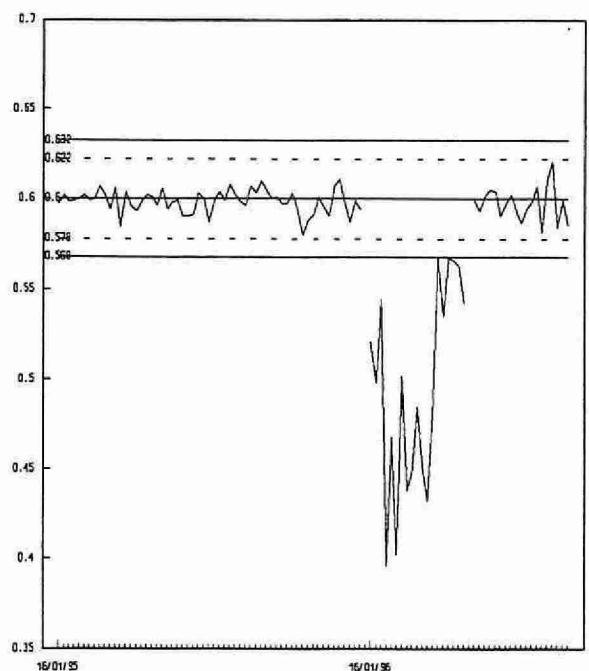
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

————— Control Limit
 - - - - - Warning Limit

SOLIDS, DISSOLVED

IDENTIFICATION:

Laboratory Unit	Solids	Method Introduced	Before '61
Method Reference No.	E3188B	Units	mg/L
LIMS Product Code	TSD3188,DS3188,DIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste		

SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Sample is filtered under moderate suction through a Whatman 934AH grade glass fibre filter. Generally 100 mL of filtrate (alternate 50 mL) is pipetted into a preweighed Teflon dish, dried at $103 \pm 2^\circ\text{C}$, and stored in a desiccator for at least 24 hours. The dissolved solids content is calculated by subtracting the original dish mass from the dried residue + dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5 decimal places), drying oven, suction filtration apparatus, dishes (Teflon).
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
--------------------------------	--------------------	---------------------

CALIBRATION:

Balance zero
Balance internal calibration is performed daily.

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1
Method Blank	100 mL distilled water.

SOLIDS, DISSOLVED

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96

Laboratory Unit: Solids

CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	422	50.00	49.99994	-0.00006	0.000091
B:	422	30.00	30.00007	0.00007	0.000068
A+B:	422	80.00	80.00001	0.00001	0.000141
A-B:	422	20.00	19.99988	-0.00012	0.000078

s.d.(AB) S(between runs): 0.000081 Sw(within run): 0.000055 S/Sw: 1.5

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

79.9996 - 80.0004 for A+B
19.9997 - 20.0003 for A-B

RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
96	2000.0	1995.7	11.2
98	500.0	499.2	5.7

DUPLICATES:

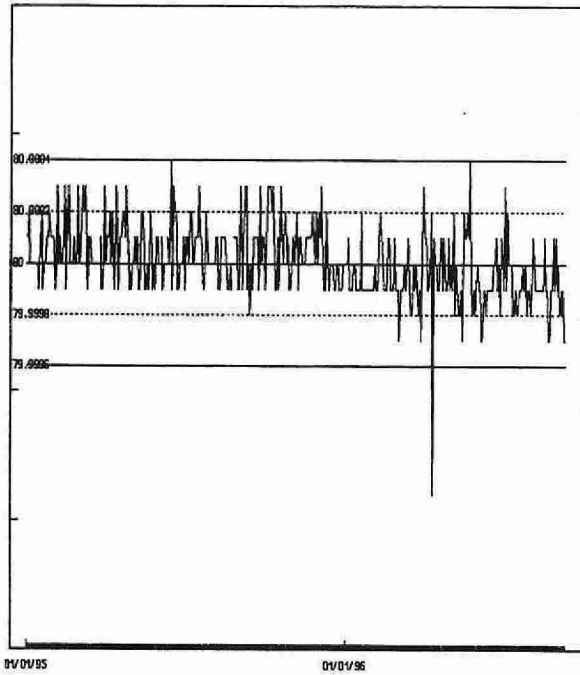
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
79	0 - 500	4.3756	1.9
76	501 - 1000	7.0565	1.2
38	1001 - 5000	9.4846	0.5
3	5001 - 10000	15.531	0.2
196	Overall	6.9137	

OTHER CHECKS:

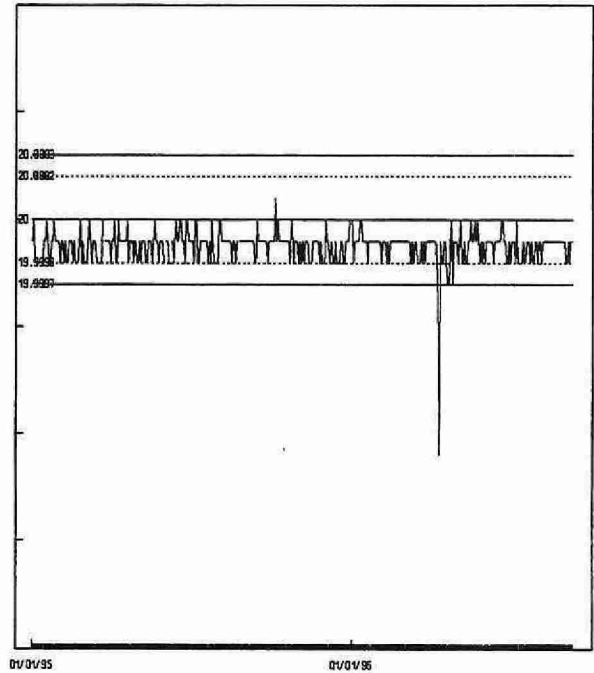
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	95	0.359	4.0158

SOLIDS, DISSOLVED (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

SOLIDS, DISSOLVED

IDENTIFICATION:

Laboratory Unit	Solids River	Method Introduced	Before '61
Method Reference No.	E3365A	Units	mg/L
LIMS Product Code	TSD3365,DS3365	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Surface Waters, Leachates		

SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Sample is filtered under moderate suction through a Whatman 934AH grade glass fibre filter. Generally 100 mL of filtrate (alternate 50 mL) is pipetted into a preweighed Teflon dish, dried at 103-105°C, and stored in a desiccator for at least 24 hours. The dissolved solids content is calculated by subtracting the original dish mass from the dried dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system. Dissolved solids may be calculated, if the conductivity is less than 800 μ S by the equation:

$$\text{Dissolved Solids} = \text{Conductivity} \times 0.65$$

INSTRUMENTATION:

Balance (5 decimal places), drying oven, suction filtration apparatus, dishes (Teflon).

Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
--------------------------------	--------------------	---------------------

CALIBRATION:

Balance zero

Balance internal calibration is performed daily.

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1.
Method Blank	100 mL distilled water.

NOTES:

December 1, 1996 - Method E3365A (River Unit) was amalgamated with Method E3188B (Wastewater Unit)

SOLIDS, DISSOLVED

QUALITY CONTROL DATA FROM 01/01/95 TO 01/04/96

Laboratory Unit: River Solids

CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	210	50.00	50.00046	0.00046	0.000085
B:	210	30.00	30.00029	0.00029	0.000071
A+B:	210	80.00	80.00075	0.00075	0.000145
A-B:	210	20.00	20.00017	0.00017	0.000061

s.d.(AB) S(between runs): 0.000079 Sw(within run): 0.000043 S/Sw: 1.8

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

80.00045 - 80.00114 for A+B
19.99994 - 20.00046 for A-B

RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
119	2000.0	1995.7	21.5
119	500.0	501.1	15.3

DUPLICATES:

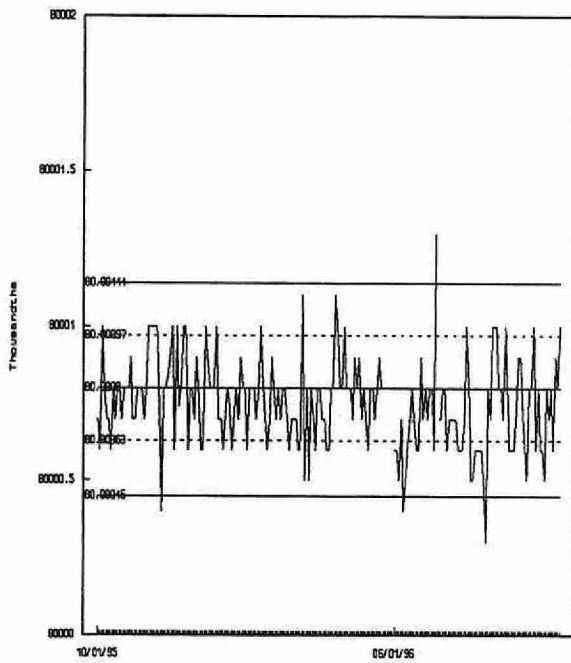
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
37	0 - 500.0	5.6293	2.8
205	500.1 - 1000.0	10.942	2.5
52	1000.1 - 5000.0	10.453	1.4
294	OVERALL	10.084	

OTHER CHECKS:

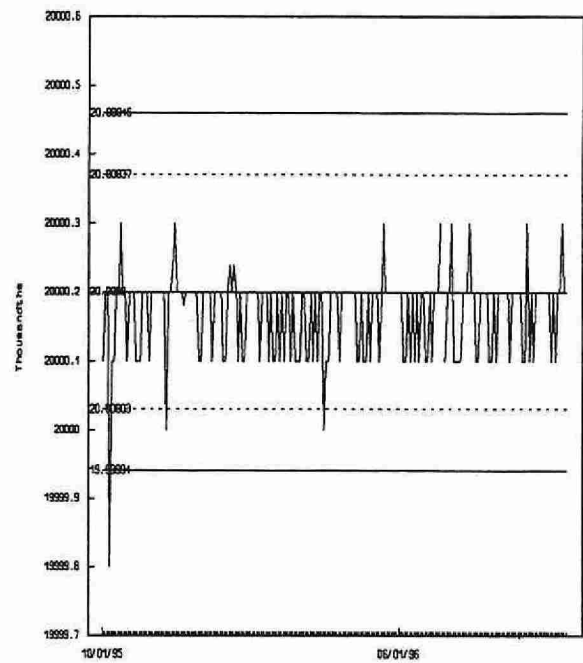
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	133	0.6931	9.7865

SOLIDS, DISSOLVED (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

SOLIDS, SUSPENDED

IDENTIFICATION:

Laboratory Unit	Solids	Method Introduced	Before '81
Method Reference No.	E3188B	Units	mg/L
LIMS Product Code	TSD3188,SS3188,SIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste		

SAMPLING:

Quantity Required	5-500 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

An appropriately shaken sample volume (5 to 500 mL) is pipetted or quickly poured into a graduated cylinder, and the volume is measured. The aliquot is then filtered under moderate suction through a preweighed Whatman 934AH glass fibre filter. The graduated cylinder and then the filter are washed with a total of 50 mL distilled water. The filter is dried at 103-105°C, and suspended solids content is calculated by subtracting the original filter mass from the dried filter mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5-decimal places), drying oven, suction filtration apparatus.
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
--------------------------------	----------------------	----------------------

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1
Method Blank	Filter washed with 500 mL distilled water

NOTES:

A standard correction factor (-0.00022g) was applied to all filters to account for weight loss during filtering.

SOLIDS, SUSPENDED

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96

Laboratory Unit: Solids

CALIBRATION CONTROL: (QC data from SS3188 and SIGN3188)

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
C:	278	0.50	0.499998	-0.000002	0.000011
D:	278	0.05	0.049997	-0.000003	0.000011
C+D:	278	0.55	0.549995	-0.000005	0.000015
C-D:	278	0.45	0.450000	0.000000	0.000014

s.d.(AB) S(between runs): 0.00001 Sw(within run): 0.00001 S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

0.54992 - 0.55008 for A+B

0.44994 - 0.45006 for A-B

RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
386	200.0	194.4	3.0429
390	50.0	49.2	1.3123

DUPLICATES:

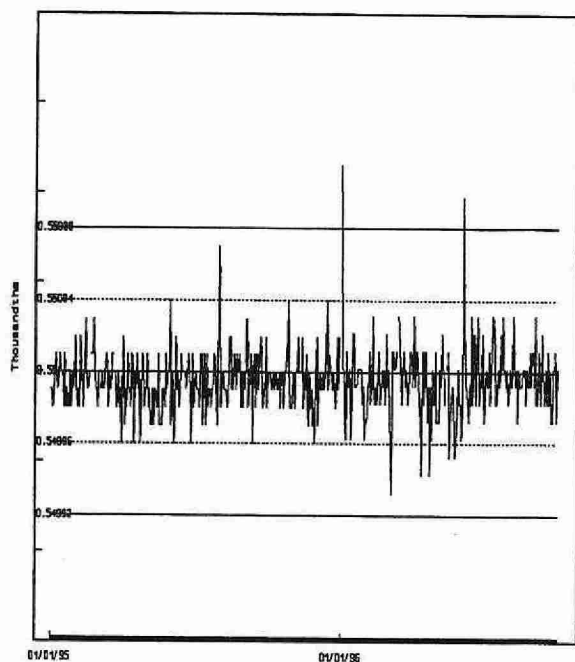
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
154	0 - 10	0.7041	15.1
139	10.1 - 25	1.3976	13.3
328	25.1 - 100	2.7007	6.7
169	100.1 - 500	9.4262	8.7
16	500.1 - 1000	17.1463	3.2
122	1000.1 - 10000	44.0370	2.8
3	10000.1 - 30000	558.594	2.5
931	Overall	4.6280	

OTHER CHECKS:

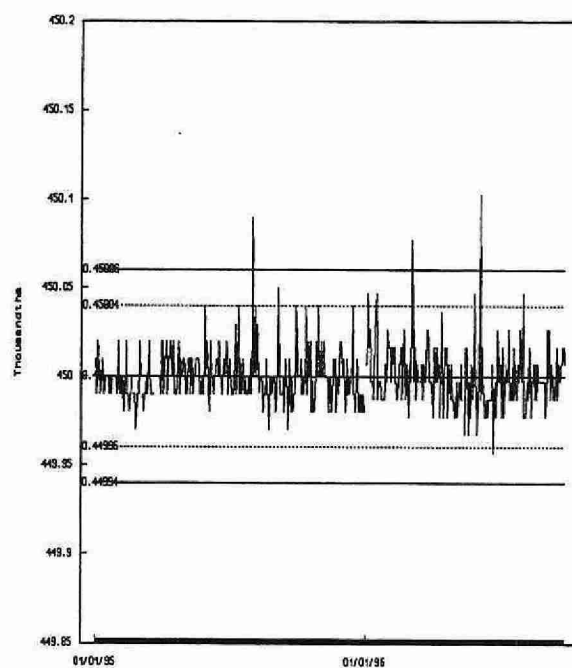
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	390	0.0710	0.1962

SOLIDS, SUSPENDED (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

———— Control Limit
----- Warning Limit

SOLIDS, SUSPENDED

IDENTIFICATION:

Laboratory Unit	Solids River	Method Introduced	Before '81
Method Reference No.	E3365A	Units	mg/L
LIMS Product Code	SS3365, TSD3365	Supervisor	J. McBride
Sample Type/Matrix	Drinking Waters, Landfill, Leachates, Surface Waters		

SAMPLING:

Quantity Required	5-500 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

An appropriately shaken sample volume (5 to 500 mL) is pipetted or quickly poured into a graduated cylinder, and the volume is measured. The aliquot is then filtered under moderate suction through a preweighed Whatman 934AH glass fibre filter. The graduated cylinder and then the filter are washed with a total of 30 mL distilled water. The filter is dried at 103-105°C, and suspended solids content is calculated by subtracting the original filter mass from the dried filter mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5-decimal places), drying oven, suction filtration apparatus.
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 1.0	Current T value: 5.0
--------------------------------	----------------------	----------------------

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1
Method Blank	Filter washed with 500 mL distilled water

NOTES:

December 1, 1996 - Method E3365A (River Unit) was amalgamated with Method E3188B (Wastewater Unit)

SOLIDS, SUSPENDED

QUALITY CONTROL DATA FROM 01/01/95 TO 29/11/96

Laboratory Unit: River Solids

CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	312	0.50	0.499926	-0.000074	0.000011
B:	312	0.05	0.049959	-0.000041	0.000014
A+B:	312	0.55	0.549885	-0.000115	0.000021
A-B:	312	0.45	0.449966	-0.000034	0.000013

s.d.(AB) S(between runs): 0.000012 Sw(within run): 0.000009 S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

0.549840 - 0.549960 for A+B
0.449915 - 0.450005 for A-B

RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
239	200.0	194.14	3.3940
238	50.0	48.56	3.3168

DUPLICATES:

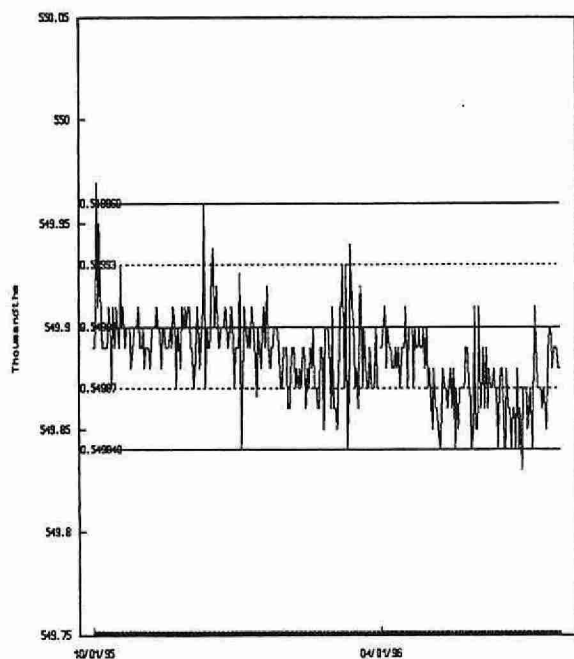
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
310	0.0 - 50.0	1.4081	10.5
159	50.1 - 200.0	4.4172	5.7
55	200.1 - 1000.0	17.1539	7.8
13	1000.1 - 5000.0	51.2243	14.1
537	OVERALL	2.9694	

OTHER CHECKS:

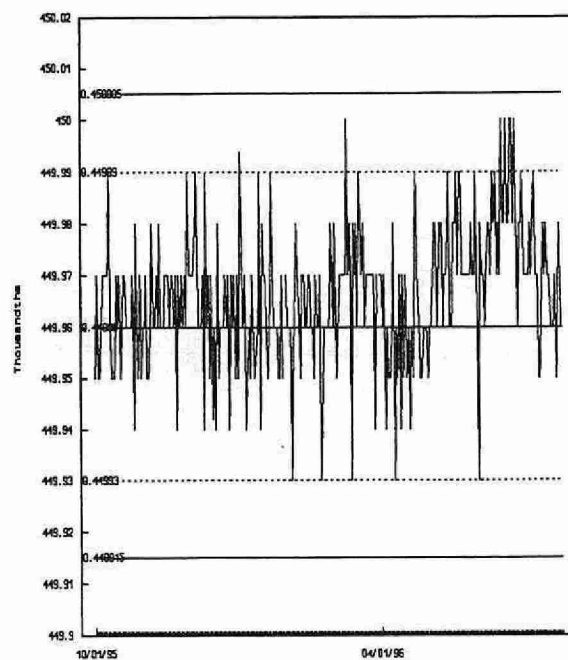
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	242	-0.01822	0.2792

SOLIDS, SUSPENDED (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 29/11/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
 ----- Warning Limit

SOLIDS, SUSPENDED IGNITED
(Particulate Ash and Particulate Loss On Ignition)

IDENTIFICATION:

Laboratory Unit	Solids	Method Introduced	Before '61
Method Reference No.	E3188B	Units	mg/L
LIMS Product Code	SIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste		

SAMPLING:

Quantity Required	5-500 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

The procedure for particulate solids (SS3188) is followed and the dried residue is ignited at $600 \pm 50^{\circ}\text{C}$ for one hour in a muffle furnace. The dish is transferred to a desiccator to cool. The particulate ash (fixed solids) is the difference between the final ignited mass plus filter and the original tare weight of the filter, divided by the original sample volume (mL) used for SS3188. The particulate loss on ignition (estimate of volatile suspended solids) is the difference between the final ignited mass plus filter and the residue (suspended solids) plus filter, divided by the original sample volume (mL). Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5 decimal places), muffle furnace, filters, Petri dishes
Microcomputer system with appropriate software

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
--------------------------------	----------------------	----------------------

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.

SOLIDS, SUSPENDED IGNITED
(Particulate Ash and Particulate Loss On Ignition)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96

Laboratory Unit: Solids

CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
C:	485	0.50	0.499998	-0.000002	0.000011
D:	485	0.05	0.049998	-0.000002	0.000016
C+D:	485	0.55	0.549995	-0.000005	0.000018
C-D:	485	0.45	0.450000	0.000000	0.000017

s.d.(AB) S(between runs): 0.000014 Sw(within run): 0.000012 S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

0.54992 - 0.55008 for A+B
0.44994 - 0.45006 for A-B

SOLIDS, SUSPENDED IGNITED (PARTICULATE ASH)

DUPLICATES:

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
48	0 - 10.0	0.5259	10.0
64	10.1 - 50.0	1.4277	7.5
19	50.1 - 500.0	4.2054	2.2
43	500.1 - 1000.0	13.7212	1.9
52	1000.1 - 5000.0	24.1872	1.2
226	OVERALL	6.8849	

OTHER CHECKS:

	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	96	-0.2460	0.2593

SOLIDS, SUSPENDED IGNITED
(Particulate Ash and Particulate Loss On Ignition)

SOLIDS, SUSPENDED IGNITED (PARTICULATE LOSS ON IGNITION)

DUPLICATES:

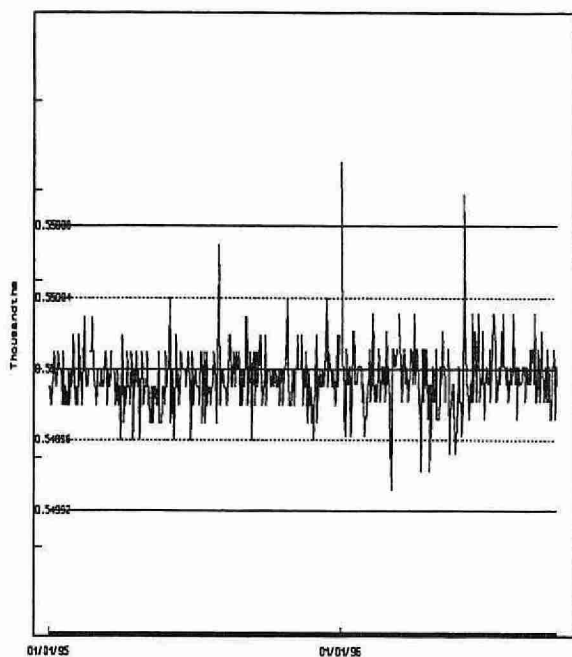
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
27	0 - 10.0	0.3543	8.1
65	10.1 - 50.0	1.2410	5.3
35	50.1 - 500.0	3.6272	6.3
4	500.1 - 1000.0	2.8693	0.3
98	1000.1 - 15000.0	31.8243	1.8
229	OVERALL	9.5707	

OTHER CHECKS:

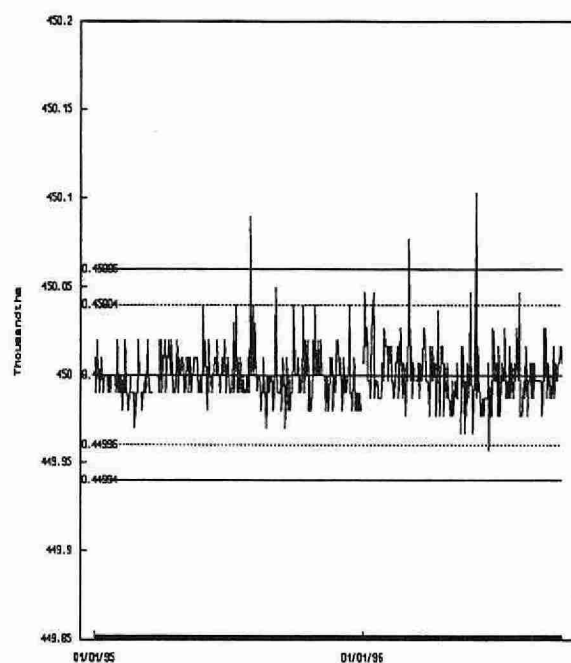
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	96	0.3623	0.1809

SOLIDS, SUSPENDED IGNITED (mg/L)
(Particulate Ash and Particulate Loss On Ignition)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

———— Control Limit
----- Warning Limit

SOLIDS, TOTAL

IDENTIFICATION:

Laboratory Unit	Solids	Method Introduced	Before '81
Method Reference No.	E3188B	Units	mg/L or mg/Kg
LIMS Product Code	TSD3188, TS3188, TIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste		

SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Generally, 100 mL aliquot of sample (alternate 50 mL) is pipetted into a preweighed Teflon dish, dried at 103-105°C, and stored in a desiccator for at least 24 hours. The total residue or solids content is calculated by subtracting the original dish mass from the dried dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5 decimal places), drying oven, dishes (Teflon).
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2.0	Current T value: 10
--------------------------------	----------------------	---------------------

CALIBRATION:

Balance zero
Balance internal calibration performed daily.

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1

SOLIDS, TOTAL

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96

Laboratory Unit: Solids

CALIBRATION CONTROL: (QC data from TS3188 + TIGN3188)

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	422	50.00	49.99994	-0.00006	0.000091
B:	422	30.00	30.00007	0.00007	0.000068
A+B:	422	80.00	80.00001	0.00001	0.000141
A-B:	422	20.00	19.99988	-0.00012	0.000078

s.d.(AB) S(between runs): 0.000081 Sw(within run): 0.000055 S/Sw: 1.5

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

79.9996 - 80.0004 for A+B
19.9997 - 20.0003 for A-B

RECOVERIES: (using 100 mL aliquot)

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
147	20000.0	20084.3	90.2
146	2000.0	2000.32	8.2

RECOVERIES: (using 50 mL aliquot)

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
91	20000.0	19923.4	73.7
89	2000.0	1999.5	20.4

DUPLICATES:

(using 100 mL aliquot)

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
86	0 - 1000	6.441	4.5
39	1001 - 5000	34.2	5.3
127	5001 - 25000	122.4	1.8
102	25001 - 50000	262.9	1.0
19	50001 - 125000	387.0	4.2
373	Overall	124.2	

SOLIDS, TOTAL cont'd

DUPLICATES:

(using 50 mL aliquot)

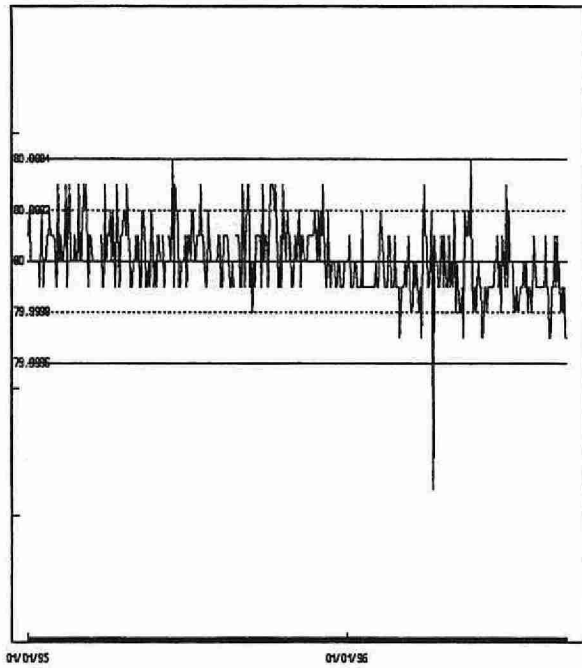
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
13	0 - 1000	3.825	0.7
61	1001 - 5000	32.0	1.2
86	5001 - 25000	82.0	0.7
44	25001 - 85000	315.0	0.7
204	Overall	88.6	

OTHER CHECKS:

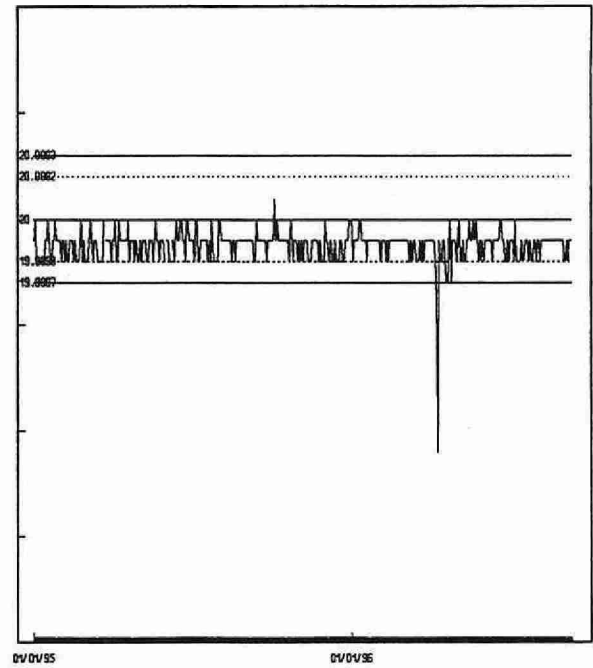
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank (using 100 mL aliquot)	148	-0.880	3.6362
Blank (using 50 mL aliquot)	89	1.7984	3.2530

SOLIDS, TOTAL (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

SOLIDS, TOTAL

IDENTIFICATION:

Laboratory Unit	Solids River	Method Introduced	Before '81
Method Reference No.	E3365A	Units	mg/L or mg/Kg
LIMS Product Code	TSD3365,TS3365	Supervisor	J. McBride
Sample Type/Matrix	Drinking Waters, Leachates,		

SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Generally, 100 mL aliquot of sample (alternate 50 mL) is pipetted into a preweighed dish, dried at 103-105°C, and stored in a desiccator for at least 24 hours. The total residue or solids content is calculated by subtracting the original dish mass from the dried dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5 decimal places), drying oven, dishes (Teflon).
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2.0	Current T value: 10
--------------------------------	----------------------	---------------------

CALIBRATION:

Balance zero
Balance internal calibration performed daily.

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1

NOTES:

December 1, 1996 - Method E3365A (River Unit) was amalgamated with Method E3188B (Wastewater Unit)

SOLIDS, TOTAL

QUALITY CONTROL DATA FROM 01/01/94 TO 31/12/96

Laboratory Unit: River Solids

CALIBRATION CONTROL: ('95 and '96)

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	210	50.00	50.00046	0.00046	0.000085
B:	210	30.00	30.00029	0.00029	0.000071
A+B:	210	80.00	80.00075	0.00075	0.000145
A-B:	210	20.00	20.00017	0.00017	0.000061

s.d.(AB) S(between runs): 0.000079 Sw(within run): 0.000043 S/Sw: 1.8

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

80.00045 - 80.00114 for A+B
19.99994 - 20.00046 for A-B

RECOVERIES: ('94, '95 and '96 data combined)

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
43	20000.0	20031.4	81.8
45	2000.0	2001.4	13.9

DUPLICATES: ('94, '95 and '96 data combined)

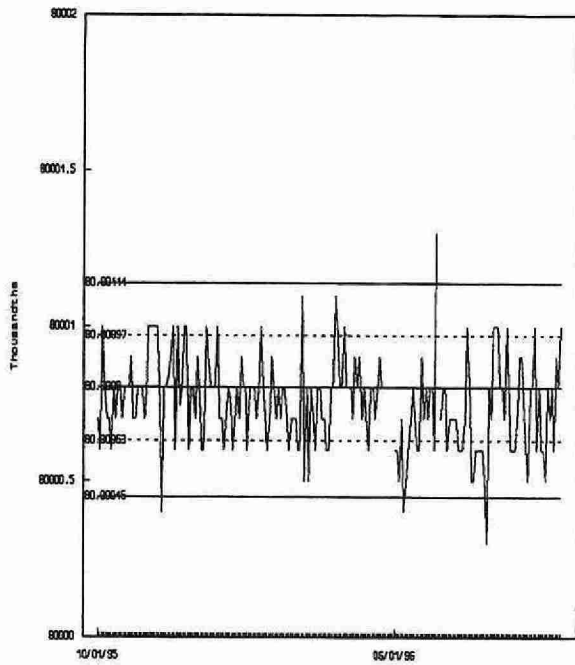
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
28	0 - 100.0	3.4412	7.1
14	100.1 - 200.0	6.7400	4.0
39	200.0 - 500.0	8.0436	3.7
11	500.1 - 2000.0	11.4389	1.1
92	OVERALL	6.8714	

OTHER CHECKS: ('94, '95 and '96 data combined)

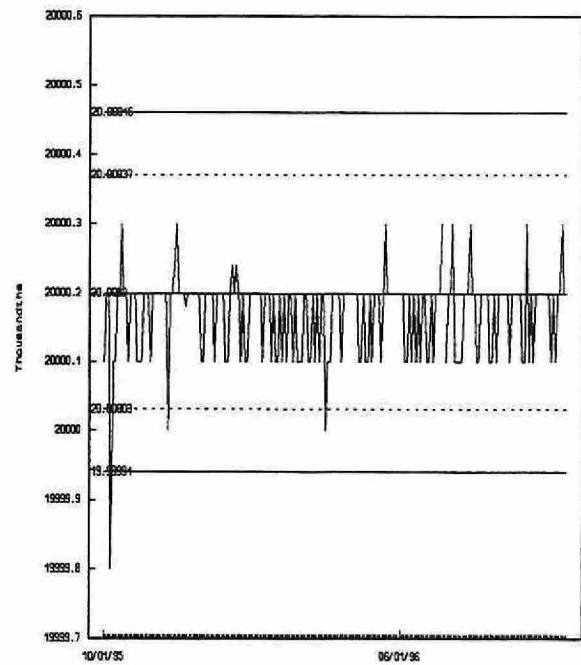
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	47	2.9277	8.0727

SOLIDS, TOTAL (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
 ----- Warning Limit

SOLIDS, TOTAL IGNITED
(Ash and Loss On Ignition)

IDENTIFICATION:

Laboratory Unit	Solids	Method Introduced	Before '61
Method Reference No.	E3188B	Units	mg/L
LIMS Product Code	TIGN3188	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste		

SAMPLING:

Quantity Required	5-500 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

The procedure for total solids (TS3188) is followed and the dried residue is ignited at $600 \pm 50^{\circ}\text{C}$ for one hour in a muffle furnace. The dish is transferred to a desiccator to cool. The ash (fixed solids) is the difference between the final ignited mass plus filter and the original tare weight of the filter, divided by the original sample volume (mL) used for TS3188. The loss on ignition (estimate of volatile total solids) is the difference between the final ignited mass plus filter and the residue (total solids) plus filter, divided by the original sample volume (mL). Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

INSTRUMENTATION:

Balance (5 decimal places), muffle furnace, filters, Petri dishes.
Microcomputer system with appropriate software.

REPORTING:

Maximum Significant Figures: 3	Current W value: 2.0	Current T value: 10
--------------------------------	----------------------	---------------------

CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.

SOLIDS, TOTAL IGNITED
(Ash and Loss On Ignition)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96

Laboratory Unit: Solids

CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	422	50.00	49.99994	-0.00006	0.000091
B:	422	30.00	30.00007	0.00007	0.000068
A+B:	422	80.00	80.00001	0.00001	0.000141
A-B:	422	20.00	19.99988	-0.00012	0.000078

s.d.(AB) S(between runs): 0.000081 Sw(within run): 0.000055 S/Sw: 1.5

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

79.9996 - 80.0004 for A+B
19.9997 - 20.0003 for A-B

SOLIDS, TOTAL IGNITED (ASH)

DUPLICATES:

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
74	0 - 2000	10.7	1.2
42	2001 - 5000	20.4	1.0
44	5001 - 10000	46.1	1.1
36	10001 - 25000	141.8	1.2
6	25001 - 50000	358.1	0.8
202	OVERALL	38.0	

OTHER CHECKS: ('96 data)

Ashed	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	39	1.0821	4.5682

SOLIDS, TOTAL IGNITED
(Ash and Loss On Ignition)

SOLIDS, TOTAL IGNITED (LOSS ON IGNITION)

DUPLICATES:

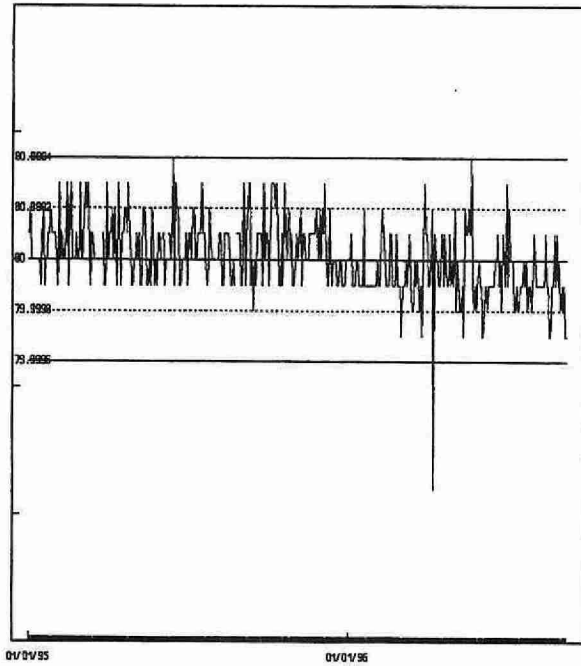
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
37	0 - 2000	11.7	1.2
62	2001 - 5000	41.5	1.6
34	5001 - 10000	83.7	2.1
52	10001 - 25000	143.4	1.1
14	25001 - 50000	320.1	0.8
199	OVERALL	76.3	

OTHER CHECKS: ('96 data)

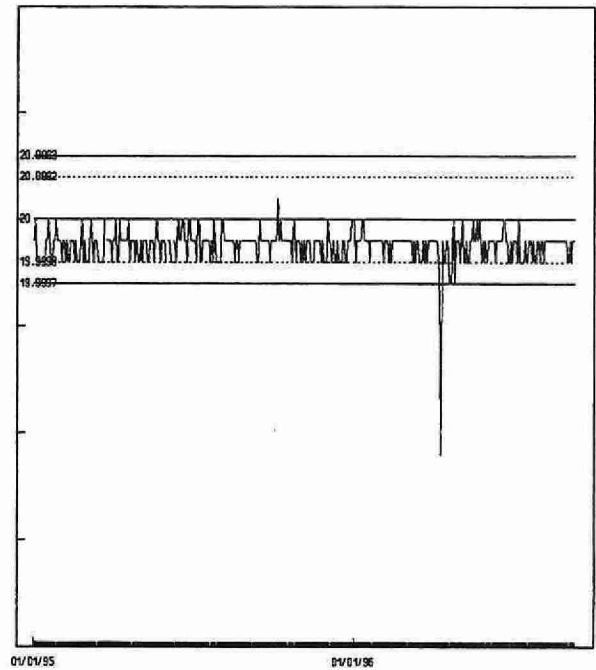
LOI	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	40	1.1313	4.5316

SOLIDS, TOTAL IGNITED (mg/L)
(Particulate Ash and Loss on Ignition)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

SULPHATE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3004A	Units	$\mu\text{g}/\text{m}^3$ as SO_4
LIMS Product Code	ANION3004	Supervisor	J. McBride
Sample Type/Matrix	Glass fibres and high purity quartz filters (Ag and Aq)		

SAMPLING:

Quantity Required	3/4" or 1.9cm strip from 8"x10" filter
Container	50 mL polypropylene tube

SAMPLING PREPARATION:

A 3/4" strip is cut in pieces and deposited into a 50 mL polypropylene tube. 50 mL of Pure-Water is added to the tube. The tube is placed on a horizontal shaker for approximately 1 hour. The supernatant is then filtered into a 15 mL plastic tube and analysed.

ANALYTICAL PROCEDURE:

Sulphate separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of sodium bicarbonate and sodium carbonate and a conductivity detector. The concentration of sulphate (mg/L) is determined by the comparison of the analyte peak area count to that of a series of standards. The analyte result is corrected for the filter blank before the final calculation is made. The result is reported as $\mu\text{g}/\text{m}^3$ as SO_4 .

Chloride and nitrate are determined simultaneously.

INSTRUMENTATION:

Horizontal Shaker, ion chromatographic system plus a PC with ChromPerfect software and DT2804 card for automated sample injection, timing, and data processing.

REPORTING:

Maximum Significant Figures: 2	Current W value: $0.1 \mu\text{g}/\text{m}^3$	Current T value: $0.5 \mu\text{g}/\text{m}^3$
--------------------------------	---	---

CALIBRATION:

6 standards

CONTROLS:

Calibration	MB, IS(n), CS1, and CS2
Drift	Duplicate plus 2 standard approximately every 20 samples

SULPHATE cont'd

NOTES:

Duplicate criterion is based on duplicate analysis of the same filter because duplicate filters are not received. To convert unit from mg/L to $\mu\text{g}/\text{m}^3$, the final concentration of SO_4 in mg/L is multiplied by the following formula:

$$\text{Result}(\text{mg/L}) \times 50\text{mL} \times (63/6.75) / \text{air volume} = \mu\text{g}/\text{m}^3$$

Where: 63 is the area of the filter exposed and 6.75 is the sample aliquot are (in^2)

SULPHATE

QUALITY CONTROL DATA FROM 02/07/96 TO 31/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 14.7 $\mu\text{g}/\text{m}^3$ as SO_4

DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
41	0 - 0.294	0.1077	1.2
33	0.295 - 7.35	0.2611	2.1
24	7.35 - 14.7	1.0526	2.7
98	Overall	0.3162	

SULPHATE

IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/04/78
Method Reference No.	E3147A	Units	mg/L as SO ₄
LIMS Product Code	ANION3147	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO₄ is determined by the comparison of the sample peak heights to a series of standards.

Chloride is determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	1 standard every 10 samples.

SULPHATE

QUALITY CONTROL DATA FROM 04/01/95 TO 18/12/96

Laboratory Unit: Dorset

Full Scale: to 10.0 mg/L as SO₄

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	76	8.0	7.978	-0.022	0.0711
B:	76	2.0	1.989	-0.011	0.0367
A+B:	76	10.0	9.964	-0.036	0.0867
A-B:	76	6.0	5.989	-0.011	0.0720

s.d.(AB)

S(between runs):

0.057

Sw(within run):

0.051

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.70 - 10.30 for A+B

5.84 - 6.16 for A-B

DUPLICATES:

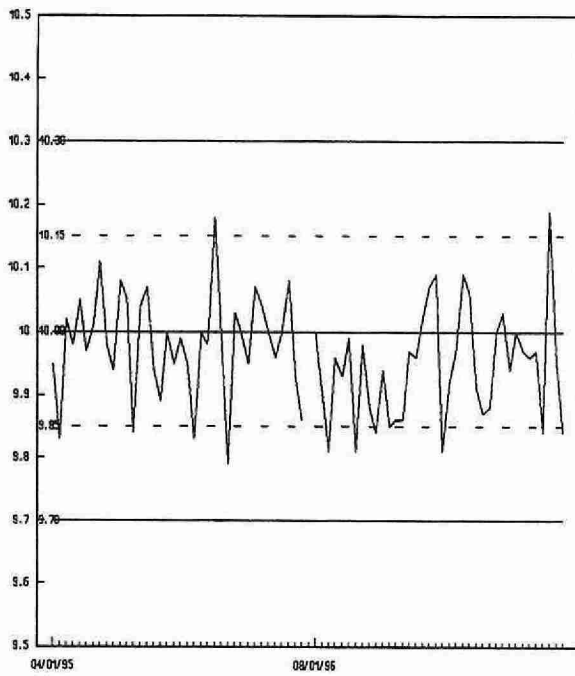
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
37	0.00 - 1.00	0.0182	6.7
30	1.01 - 2.00	0.0527	4.4
71	2.01 - 5.00	0.0577	1.5
124	5.01 - 10.0	0.0733	1.2
262	Overall	0.0584	

OTHER CHECKS:

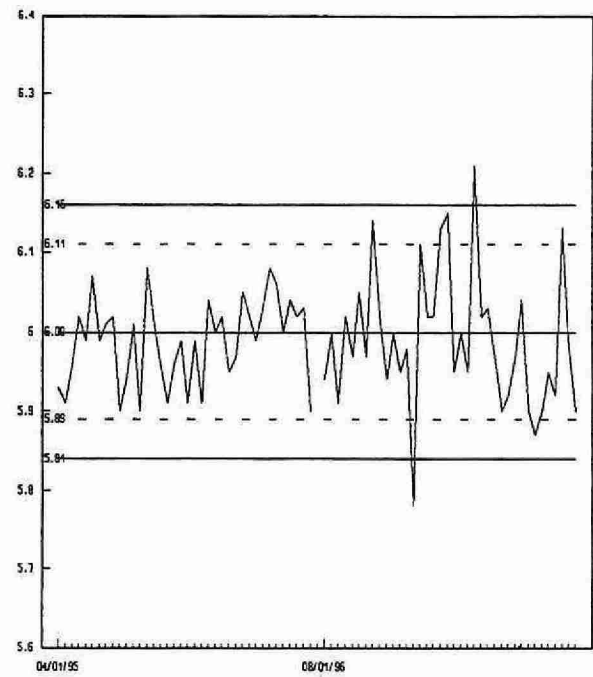
	n	Mean	Standard Deviation (1)
Long Term Blank	76	0.01	0.0231

SULPHATE (mg/L as SO₄)

QUALITY CONTROL DATA FROM 04/01/95 TO 17/10/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit

----- Warning Limit

SULPHATE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3148A	Units	µg/Filter as SO ₄
LIMS Product Code	LOV3148, ANLOV3148, TEF3148, NYL3148, SDIO3148, ANION3148	Supervisor	J. McBride
Sample Type/Matrix	W40 filters from LoVol filter packs. Teflon filters from Sequential filter packs. Nylon and W41 filters from both LoVol and Sequential filter packs.		

SAMPLING:

Quantity Required	1 filter for W40, Teflon or Nylon. 1 set of 2 W41 filters
Container	50 mL polypropylene tube
Other	For W41 filters, filters are impregnated with potassium carbonate / glycerol solution

SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW (W40) or 25.0 mL of DDW (Teflon) or 25.0 mL of 0.03 N NaOH (Nylon) in polypropylene tubes with ultrasonic treatment followed by a 24 hour rest period. For W41 filters, filters are extracted with 50.0 mL of 0.05% H₂O₂ in polypropylene tubes with one hour of mechanical shaking, followed by ultrasonic treatment to enhance extraction, then a 24 hour rest period. SO₂ is converted to SO₄ in the process.

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO₄ is determined by the comparison of the sample peak heights to a series of standards. Results are converted to µg/filter as SO₄ for W40, Teflon and Nylon filters. As for W41 filters, results are converted to µg/filter as SO₂. Chloride and nitrogen-nitrate are determined simultaneously.

INSTRUMENTATION:

Mechanical shaker, Ultrasonic bath; modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02 mg/L	Current T value: 0.1 mg/L
--------------------------------	----------------------------	---------------------------

CALIBRATION:

BL plus 9 standards

SULPHATE cont'd

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received. To convert unit from mg/L to $\mu\text{g}/\text{Filter}$, multiply the concentration of SO_4 in mg/L by 50 for W40 filters or 25 for Teflon or Nylon filters or 33.3 for W41 filters.

SULPHATE

QUALITY CONTROL DATA FROM 13/01/95 TO 10/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 10.0 mg/L as SO₄

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	46	8.0	8.004	0.004	0.0769
B:	46	2.0	1.995	-0.005	0.0270
A+B:	46	10.0	9.998	-0.002	0.0917
A-B:	46	6.0	6.007	0.007	0.0699

s.d.(AB)

S(between runs): 0.058 Sw(within run):0.049

S/Sw:1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.68 - 10.32 for A+B
5.76 - 6.24 for A-B

DUPLICATES:

For W40 filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
9	0 - 2.00	0.0162	1.3
26	2.01 - 5.00	0.0156	0.8
6	5.01 - 10.00	0.0296	0.6
41	Overall	0.0175	

For Teflon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
21	0 - 1.00	0.0099	1.8
24	1.01 - 2.00	0.0188	1.6
19	2.01 - 5.00	0.0197	0.6
4	5.01 - 10.00	0.0259	0.4
68	Overall	0.0162	

SULPHATE

QUALITY CONTROL DATA FROM 13/01/95 TO 10/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 10.0 mg/L as SO₄

For Nylon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
77	0 - 1.00	0.0205	5.6
14	1.01 - 2.00	0.0249	2.0
17	2.01 - 5.00	0.0545	1.5
2	5.01 - 10.00	N.A.	N.A.
110	Overall	0.0245	

For W41 filters:

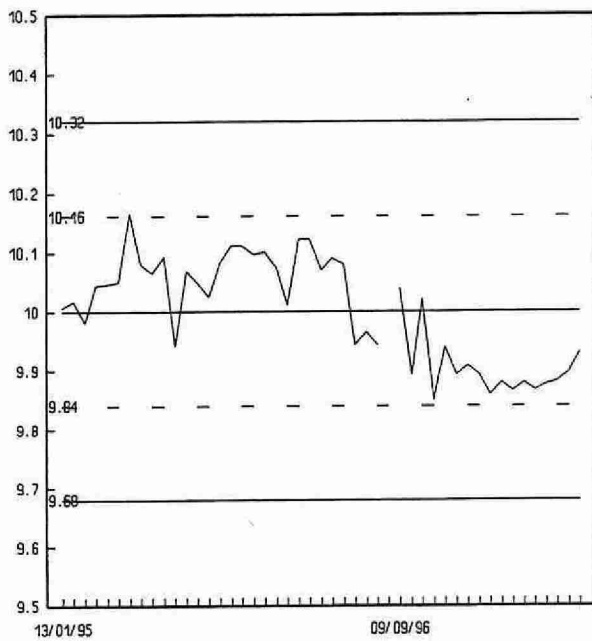
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
55	0 - 1.00	0.0064	8.0
16	1.01 - 2.00	0.0204	2.0
25	2.01 - 5.00	0.0427	1.5
7	5.01 - 10.00	0.0725	0.8
103	Overall	0.0235	

OTHER CHECKS:

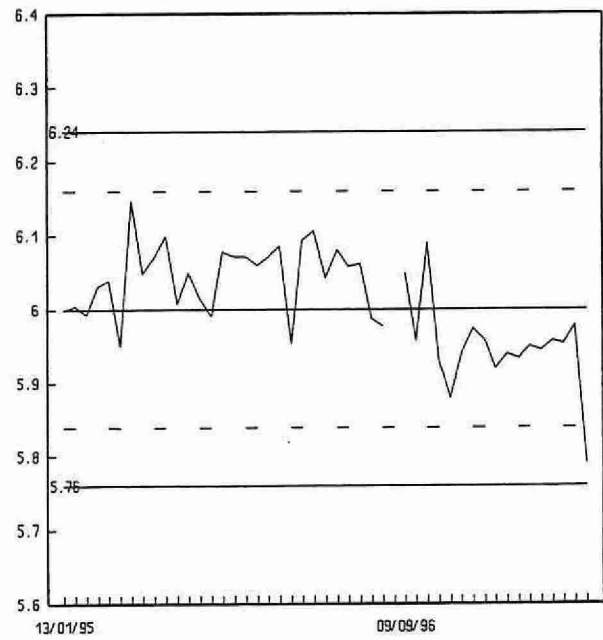
	n	Mean	Standard Deviation (1)
Long Term Blank	46	0.0011	0.0075

SULPHATE (mg/L as SO₄)

QUALITY CONTROL DATA FROM 13/01/95 TO 10/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

SULPHATE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/82
Method Reference No	E3172A	Units	mg/L as SO ₄
LIMS Product Code	SULP3172	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Domestic Waters, Leachates, Soil Extracts, Effluents		

SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the samples by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. The concentration of sulphate in mg/L as SO₄ is determined by comparison of the sample scan to a series of standard scans.

INSTRUMENTATION:

Basic modular continuous flow ion chromatographic system plus control module (in-house design) for automated sample introduction and timing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
--------------------------------	----------------------	----------------------

CALIBRATION:

BL plus 10 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

SULPHATE

QUALITY CONTROL DATA FROM 05/01/95 TO 08/01/96

Laboratory Unit: Ion Chromatography

Full Scale: to 100.0 mg/L as SO₄

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	134	80.0	80.5	0.5	0.8930
B:	134	20.0	19.9	-0.1	0.5119
A+B:	134	100.0	100.4	0.4	1.1933
A-B:	134	60.0	60.7	0.7	0.8336

s.d.(AB)

S(between runs):

0.73

Sw(within run):

0.59

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

97.2 - 102.8 for A+B
57.9 - 62.1 for A-B

DUPLICATES:

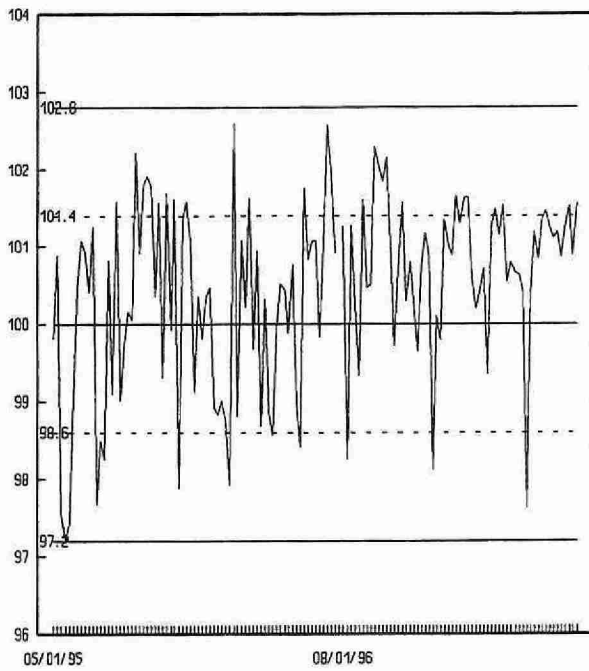
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
61	0.0 - 10.0	0.1439	5.2
67	10.1 - 20.0	0.3322	2.2
162	20.1 - 50.0	0.6632	2.2
32	50.1 - 100.0	0.8251	2.1
322	Overall	0.5201	

OTHER CHECKS:

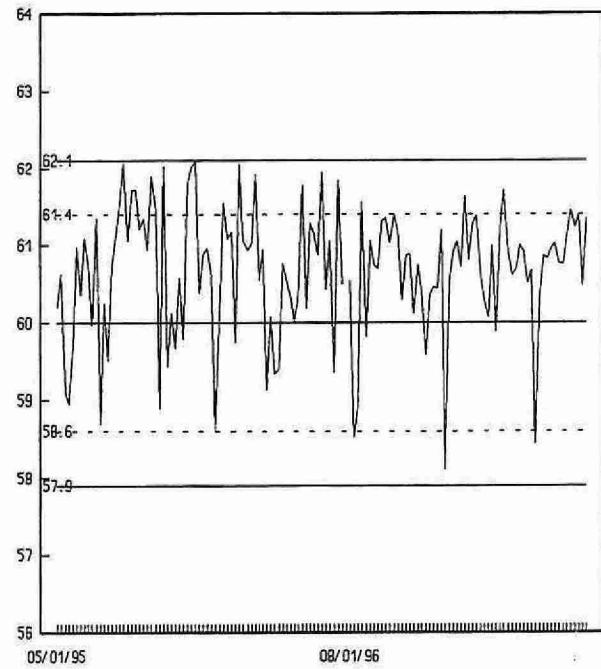
	n	Mean	Standard Deviation (1)
Long Term Blank	134	0.2692	0.4311

SULPHATE (mg/L as SO₄)

QUALITY CONTROL DATA FROM 05/01/95 TO 08/01/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

————— CONTROL LIMIT
- - - - - Warning Limit

SULPHATE

IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3372A	Units	mg/L as SO ₄
LIMS Product Code	ANION3372	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

SAMPLING:

Quantity Required	15 mL
Container	Glass or plastic

ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with Na₂CO₃/NaHCO₃ to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO₄ is determined by the comparison of the sample peak heights to a series of standards. Chloride and nitrogen-nitrate are determined simultaneously.

INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus 7 standards

CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

NOTES:

Same analytical method as E3147A operating in Dorset Lab. New method number introduced for Toronto Lab in 1993 is E3372A.

SULPHATE

QUALITY CONTROL DATA FROM 12/01/95 TO 10/12/96

Laboratory Unit: Ion Chromatography

Full Scale: to 5.0 mg/L as SO₄

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	35	4.00	3.999	-0.001	0.0345
B:	35	1.00	1.005	0.005	0.0133
A+B:	35	5.00	5.004	0.004	0.0378
A-B:	35	3.00	2.993	-0.007	0.0361

s.d.(AB)

S(between runs):

0.0262

Sw(within run):

0.0255

S/Sw: 1.02

The calibration is accepted if the calibration control values obtained lie within the ranges:

4.79 - 5.21 for A+B
2.84 - 3.16 for A-B

DUPLICATES:

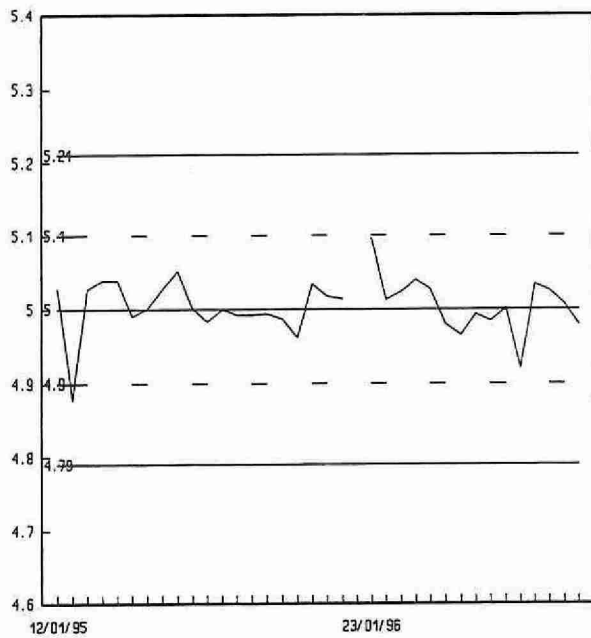
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
10	0.00 - 1.00	0.0090	3.6
22	1.01 - 2.50	0.0247	1.5
4	2.50 - 5.00	0.0571	1.7
36	Overall	0.0247	

OTHER CHECKS:

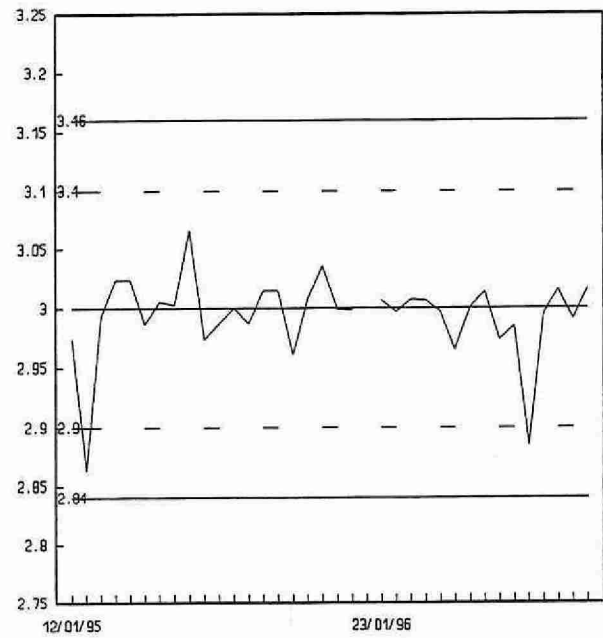
	n	Mean	Standard Deviation (1)
Long Term Blank	35	0.000	0.0000

SULPHATE (mg/L as SO₄)

QUALITY CONTROL DATA FROM 12/01/95 TO 10/12/96



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

———— Control Limit
----- Warning Limit

TURBIDITY

IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	Before '74
Method Reference No:	E3311A	Units:	FTU
LIMS Product Code:	TURB3311	Supervisor:	J. McBride
Sample Type/Matrix:	Rivers, Lakes, Effluents, Drinking Water, Industrial Waste, Sewage		

SAMPLING:

Quantity Required:	50 mL
Container:	Glass or plastic

ANALYTICAL PROCEDURE:

The instrument is standardized with sealed standards which are prepared commercially and rated in Formazin Turbidity Units. Samples are placed in the turbidimeter, and results in FTU are read directly from the digital output. Turbidity measurement are based on light scattering at 90 plus or minus 30 degrees of rotation. The instrument compensates for sample colour.

INSTRUMENTATION:

-Hach Ratio/XR Model Turbidimeter modified to accept control signals from robot controller, electronic interphase, Zymark ZYMATE 11 Laboratory Robot System, IBM PC computer.

REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
--------------------------------	-----------------------	-----------------------

CALIBRATION:

BL plus formazin standards (once every four months)

CONTROLS:

Calibration:	5 standards, e.g. QCA
--------------	-----------------------

TURBIDITY

QUALITY CONTROL DATA FROM 03/01/96 TO 27/12/96

Laboratory Unit: Colourimetry

Full Scale: to 2000 FTU

CALIBRATION CONTROL: FROM 03/01/96 TO 27/12/96 (A)
FROM 03/01/96 TO 08/07/96 (B,C,D)

	n	Expected Concentration	Mean Concentration	Standard Deviation (1)
A:	154	2.0	1.41	0.0195
B:	74	20.0	14.65	0.1558
C:	74	200.0	154.38	1.4401
D:	74	2000.0	1453.51	9.9839

On any given day the calibration is accepted if the values obtained lie within the ranges:

1.47	-	1.35	for	A
15.14	-	14.18	for	B
148.78	-	159.82	for	C
1454	-	1484	for	D

CALIBRATION CONTROL: FROM 10/07/96 TO 27/12/96 (B,C,D)

	n	Expected Concentration	Mean Concentration	Standard Deviation (1)
B:	79	20.0	15.099	0.1468
C:	79	200.0	124.467	1.8405
D:	79	2000.0	1472.175	9.8813

On any given day the calibration is accepted if the values obtained lie within the ranges:

14.62	-	15.58	for	B
118.98	-	130.02	for	C
1472	-	1502	for	D

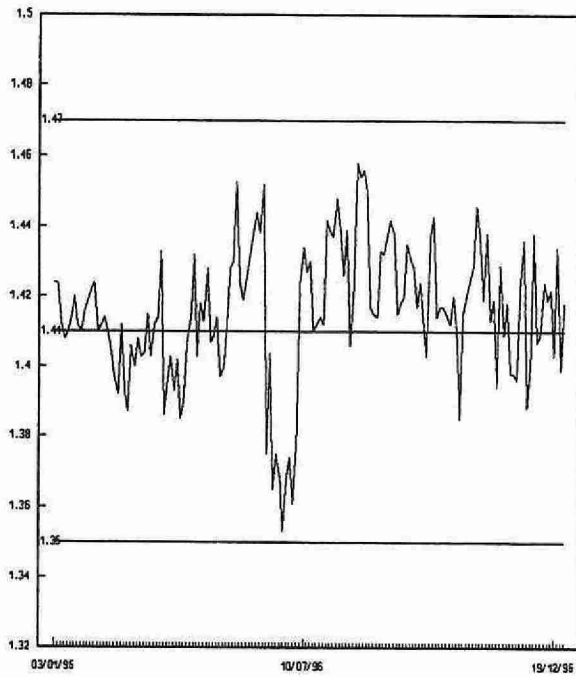
	n	Data Mean	Standard Deviation (1)
Stray Light	154	0.0441	0.0013

DUPLICATES:

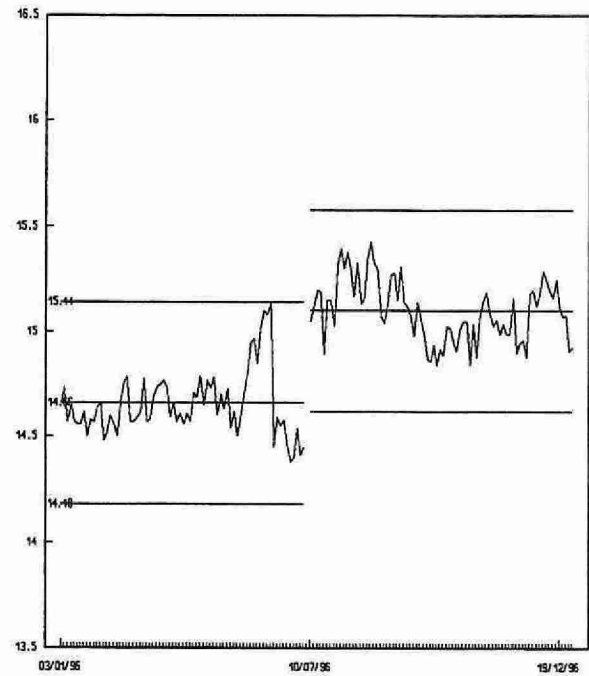
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
235	0.0 - 2.0	0.0521	15.7
134	2.1 - 20.0	0.6232	15.9
31	21.0 - 200	3.1333	34.7
3	201 - 2000	14.430	1.8
403	Overall	0.2483	

TURBIDITY (FTU)

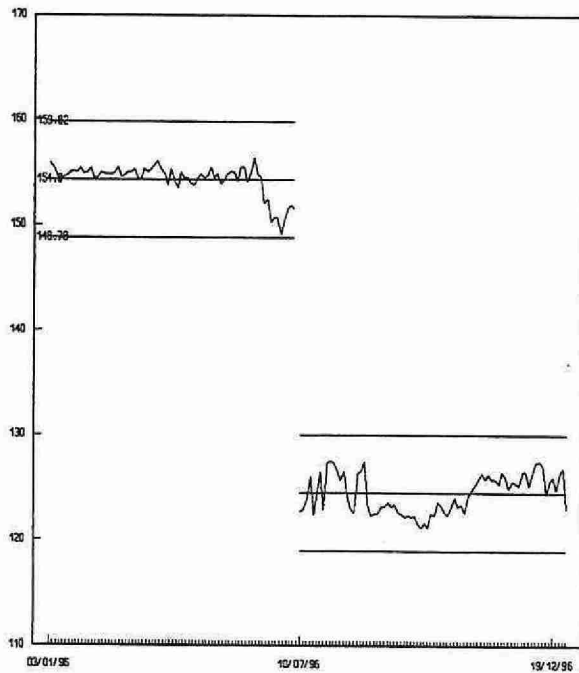
QUALITY CONTROL DATA FROM 03/01/96 TO 27/12/96



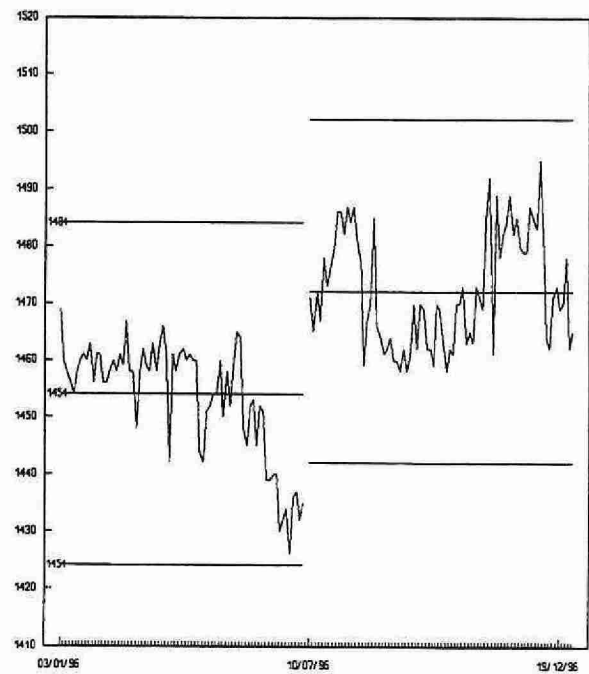
QUALITY CONTROL STANDARD A



QUALITY CONTROL STANDARD B



QUALITY CONTROL STANDARD C



QUALITY CONTROL STANDARD D

Control Limit

BIBLIOGRAPHY

1. Laboratory Services Branch, *A Guide to the Collection and Submission of Samples for Laboratory Analysis*. 1993.
2. Laboratory Service Branch, *Quality Assurance Manual*, May 1997.
3. Laboratory Services Branch, *Code of Practice for Environmental Laboratories*. D.E. King. September 1989.
4. Laboratory Services Branch, *Procedures Manual, A Companion Document to the Quality Assurance Manual*, June 1997.
5. Laboratory Services Branch, Data Quality Report Series, *Principles of Control Charting*. D.E. King. February 1984.
6. Laboratory Services Branch, *Performance Report, Water Quality Analyses Section*. S. Janhurst. 1995.
7. Laboratory Service Branch, Water Quality Section, *Standard Operating Procedure for Method Intercomparison*. M. Rawlings. December 1990.
8. Laboratory Service Branch, Water Quality Section, *Regression Techniques for Analytical Chemistry Technicians*. M. Rawlings. January 1991.

ABBREVIATIONS

AAS	- Atomic Absorption Spectrophotometer
Abs	- Absorbance
APIOS	- Acidic Precipitation in Ontario Study
Av	- Average
Bl	- Blank
C	- Degree Centigrade
cm	- Centimetre
Concn	- Concentration
Date	- Day/Month/Year
DDW	- Deionized distilled water
Pure-DW	- Pure Deionized Water
DO	- Dissolved oxygen
DW	- Distilled water
ECSS	- Expert Committee on Soil Survey (Land Resource Research Centre)
EPA	- Environmental Protection Agency
FTU	- Formazin Turbidity Units
g	- Gram
HOAC	- Acetic Acid
HZU	- Hazen Units
IR	- Infra-Read
L	- Litre
LAB	- Laboratory
LIMS	- Laboratory Information Management System
LIS	- Laboratory Information System
LTBL	- Long Term Blank
M	- Molar
meq	- Milliequivalent
mg	- Milligram
min	- Minute

ABBREVIATIONS cont'd

mL	- Millilitre
mm	- Millimetre
N/A	- Not Available or Not Applicable
nm	- Nanometre
NRC	- National Research Council
QC	- Quality Control
QCA	- Quality Control Standard A
QCB	- Quality Control Standard B
QCC	- Quality Control Standard C
QCD	- Quality Control Standard D
R	- Recovery
rpm	- Revolutions per minute
S	- Between run standard deviation
S ₁	- Standard Deviation (Conventional)
S ₂	- Standard Deviation for duplicates
S _w	- Within run standard deviation
S. Class	- Weight classification designation (not certified)
s.d.	- Standard deviation
Standard Cal	- Colourimeter setting to control electronic expansion
STD	- Standard
TCU	- True Colour Units
μm	- Micrometer
μeq	- Microequivalent
μg	- Microgram
μS	- Micro-Siemen
UV	- Ultra-Violet
V/V	Concentration based on volume measurements

APPENDIX A

W & T :

W and T are low level data qualifiers assigned to data that are near or below the detection limit values (3)(8). The code <W indicates that no measurable response was observed under the test conditions. The reported value indicates the minimum amount of analyte that could have been measured under routine conditions. The <T code is used to represent a measurable amount of the analyte which under the test conditions is not verifiable. The reported result should be used only for large batches of similar data to evaluate background levels or trends of contaminants in the environment where more sensitive analytical methods are not available.

To provide a consistent Laboratory Services Branch approach to data reporting, the Water Quality Analyses Section calculates W from the standard deviation of duplicates (S_2), near zero, by rounding down to the nearest 1, 2 or 5 digit. T is five times W. W and T values for this report are summarized in Appendix B.

Appendix B
W and T values for '95 and '96

Parameter	Method Reference No.	Units	Full Scale	W	T
Acidity, Gran	(E3248A)	µg/L H ⁺	1000	1.0	5.0
Acidity, Total Fixed Endpoint	(E3248A)	mg/L CaCO ₃	1000	0.05	0.25
Alkalinity, Gran	(E3042A)	mg/L CaCO ₃	-	-	-
Alkalinity, Total Fixed Endpoint	(E3042A)	mg/L CaCO ₃	500	0.05	0.25
Alkalinity, Total Fixed Endpoint	(E3218A)	mg/L CaCO ₃	1000	0.2	1.0
Alkalinity, Total Fixed Endpoint	(E3289A)	mg/L CaCO ₃	1000	0.2	1.0
Aluminum, Total	(E3300A)	µg/L Al	1000	2	10
Calcium	(E3146A)	mg/L Ca	2.0	0.005	0.025
Calcium	(E3171A)	mg/L Ca	40.0	0.05	0.25
Calcium	(E3217A)	mg/L Ca	200.0	0.2	1.0
Calcium	(E3249A)	mg/L Ca	8.0	0.02	0.1
Carbon, Dissolved Inorganic	(E3028A)	mg/L C	10.0	0.02	0.1
Carbon, Dissolved Inorganic	(E3370A)	mg/L C	80.0	0.2	1.0
Carbon, Dissolved Organic	(E3370A)	mg/L C	20.0	0.1	0.5
Carbon, Total Organic	(E3247B)	mg/L C	25.0	0.2	1.0
Carbon, Total Particulate	(E3141A)	mg/L C	100	0.2	1.0
Chloride	(E3004A)	µg/m ³ Cl	14.7	0.1	0.5
Chloride	(E3016A)	mg/L Cl	100	0.2	1.0
Chloride	(E3147A)	mg/L Cl	2.0	0.01	0.05
Chloride	(E3148A)	µg/filter Cl	2.0	0.02 mg/L	0.10 mg/L
Chloride	(E3372A)	mg/L Cl	1.0	0.01	0.05
Chlorine, Total Residual	(E3309A)	µg/L Cl ₂	50	2	10
Chlorophyll "a"	(E3169A)	µg/L	-	0.2	1.0
Chlorophyll "a" Acidified	(E3169A)	µg/L	-	1.0	5.0
Chlorophyll "b"	(E3169A)	µg/L	-	0.1	0.5
Colour, True	(E3025A)	TCU	100	0.2	1.0
Colour, True	(E3219A)	TCU	100	0.2	1.0
Conductivity	(E3024B)	µS/cm	500	0.2	1.0

Appendix B
W and T values for '95 and '96

Parameter	Method Reference No.	Units	Full Scale	W	T
Conductivity	(E3177A)	µS/cm	100	0.2	1.0
Conductivity	(E3218A)	µS/cm	2000	1	5
Conductivity	(E3289A)	µS/cm	2000	1	5
Cyanide, Free	(E3014A)	mg/L CN ⁻	0.2	0.001	0.005
Cyanide, Total	(E3015A)	mg/L CN ⁻	0.2	0.001	0.005
Fluoride	(E3369A)	mg/L F	2.0	0.01	0.05
Hardness	(E3171A)	mg/L CaCO ₃	-	0.2	1.0
Hardness	(E3217A)	mg/L CaCO ₃	-	0.5	2.5
Hardness	(E3249A)	mg/L CaCO ₃	-	0.05	0.25
Iron, Total	(E3303B)	µg/L Fe	1000	2	10
Lithium	(E3392A)	µg/L Li	1000	1	5
Magnesium	(E3146A)	mg/L Mg	0.5	0.001	0.005
Magnesium	(E3171A)	mg/L Mg	10.0	0.02	0.01
Magnesium	(E3217A)	mg/L Mg	50.0	0.05	0.25
Magnesium	(E3249A)	mg/L Mg	2.0	0.005	0.025
Manganese	(E3303B)	µg/L Mn	200	1	5
Nitrate	(E3004A)	µg/m ³ NO ₃	14.7	0.1	0.5
Nitrogen,					
Ammonia Plus Ammonium	(E3149A)	mg/L N	2.0	0.002	0.01
Ammonia Plus Ammonium	(E3364A)	mg/L N	2.0	0.002	0.01
Ammonia Plus Ammonium	(E3366A)	mg/L N	50.0	0.05	0.25
Ammonia Plus Ammonium	(E3374A)	µg/L N	1000	1	5
Nitrogen, Nitrate	(E3148A)	µg/Filter N	2.0 mg/L	0.01 mg/L	0.05 mg/L
Nitrogen, Nitrate	(E3372A)	mg/L N	1.0	0.01	0.05
Nitrogen, Nitrate Plus Nitrite	(E3364A)	mg/L N	5.00	0.005	0.025
Nitrogen, Nitrate Plus Nitrite	(E3366A)	mg/L N	50.0	0.05	0.25
Nitrogen, Nitrate Plus Nitrite	(E3369A)	mg/L N	20.0	0.1	0.5
Nitrogen, Nitrate Plus Nitrite	(E3374A)	µg/L N	1000	2	10

Appendix B
W and T values for '95 and '96

Parameter	Method Reference No.	Units	Full Scale	W	T
Nitrogen, Nitrite	(E3364A)	mg/L N	0.200	0.001	0.005
Nitrogen, Nitrite	(E3366A)	mg/L N	2.00	0.005	0.025
Nitrogen, Total Kjeldahl	(E3116A)	mg/g N	20	0.1	0.5
Nitrogen, Total Kjeldahl	(E3118A)	mg/g N	100	0.2	1
Nitrogen, Total Kjeldahl	(E3367A)	mg/L N	2.00	0.02	0.1
Nitrogen, Total Kjeldahl	(E3368A)	mg/L N	50.0	0.05	0.25
Oxygen Demand, Biochemical	(E3182A)	mg/L O	9.0	0.2	1
Oxygen Demand, Chemical	(E3170A)	mg/L O	40.0	1	5
Oxygen Demand, Chemical	(E3246A)	mg/L O	500	2	10
pH	(E3042A)	-	-	-	-
pH	(E3218A)	-	-	-	-
pH	(E3248A)	-	-	-	-
pH	(E3289A)	-	-	-	-
Phenolics, Reactive	(E3179A)	µg/L Phenol	50.0	0.2	1.0
Phosphorus,					
Reactive ortho-Phosphate	(E3364A)	mg/L P	0.100	0.0005	0.0025
Reactive ortho-Phosphate	(E3366A)	mg/L P	10.0	0.02	0.10
Phosphorus, Total	(E3116A)	mg/g P	5	0.02	0.10
Phosphorus, Total	(E3118A)	mg/g P	8	0.02	0.10
Phosphorus, Total	(E3367A)	mg/L P	0.200	0.002	0.01
Phosphorus, Total	(E3368A)	mg/L P	10.0	0.02	0.10
Potassium	(E3146A)	mg/L K	1.00	0.002	0.010
Potassium	(E3171A)	mg/L K	5.00	0.01	0.05
Potassium	(E3217A)	mg/L K	25.0	0.05	0.25
Potassium	(E3249A)	mg/L K	1.0	0.005	0.025
Silicon, Reactive Silicates	(E3370A)	mg/L Si	10.0	0.02	0.10
Sodium	(E3146A)	mg/L Na	1.0	0.002	0.010
Sodium	(E3171A)	mg/L Na	20.0	0.02	0.10

Appendix B
W and T values for '95 and '96

Parameter	Method Reference No.	Units	Full Scale	W	T
Sodium	(E3217A)	mg/L Na	100	0.2	1.0
Sodium	(E3249A)	mg/L Na	4.0	0.005	0.025
Solids, Dissolved	(E3188B)	mg/L	-	2	10
Solids, Dissolved	(E3365A)	mg/L	-	2	10
Solids, Suspended	(E3188B)	mg/L	-	0.5	1.0
Solids, Suspended	(E3365A)	mg/L	-	1.0	5.0
Solids, Suspended Ignited	(E3188B)	mg/L	-	0.5	2.5
Solids, Total	(E3188B)	mg/L	-	2.0	10.0
Solids, Total	(E3365A)	mg/L	-	2.0	10.0
Solids, Total Ignited	(E3188B)	mg/L	-	2.0	10.0
Sulphate	(E3004A)	$\mu\text{g}/\text{m}^3 \text{SO}_4$	14.7	0.1	0.5
Sulphate	(E3147A)	mg/L SO_4	10.0	0.05	0.25
Sulphate	(E3148A)	$\mu\text{g}/\text{filter} \text{SO}_4$	10.0 mg/L	0.02 mg/L	0.1 mg/L
Sulphate	(E3172A)	mg/L SO_4	100	0.5	2.5
Sulphate	(E3372A)	mg/L SO_4	5.0	0.05	0.25
Turbidity	(E3311A)	FTU	2000	0.01	0.05



(7917)

TD/380/P47/1995-6/MOE

TD/380/P47/1995-6/MOE
Ontario Ministry of the En
Performance report -
general chemistry aimu
 c.1 a aa